THE IN-PLACE POLLUTANTS PROGRAM

VOLUME IV

PHASE 1 DATA SUMMARY

AUGUST 1989

Environment Ontario

Jim Bradley
Minister

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VOLUME IV

PHASE 1 DATA SUMMARY

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Water Resources Branch

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ACKNOWLEDGEMENTS

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INTRODUCTION

In 1983, the Ontario Ministry of the Environment carried out the first phase of the In-Place Pollutants Program. The studies associated with this phase of the program were designed to obtain information on the physical and chemical characteristics of surficial sediment and the levels of contaminants in representative species of benthic invertebrates in selected areas of the Great Lakes.

This report, Volume IV, contains the raw data obtained from the field and laboratory studies carried out during the 1983 In-Place Pollutants Program. Companion volumes provide the following:

Volume I - A Program Overview
(March, 1987)

Volume II - Background and Theoretical Concepts
(March, 1987)

Volume III - Phase 1 Studies
(October, 1987)

Subsequent phases of the In-Place Pollutants Program will be reported in other volumes of this series.

1.0 STUDY LOCATIONS

During the 1983 Field Season, 87 stations were sampled from 14 locations in Lake Ontario and four of the Great Lakes Interconnecting channels. The locations and number of stations are given in Table 1.1. See Figures 1.1 - 1.12 for station locations.

TABLE 1.1 - Phase 1 Study Locations and Number of Stations

STUDY LOCATIONS	NO. OF STATIONS
LAKE ONTARIO	
Windermere Basin (in Hamilton Harbour)	5
Outside Hamilton Harbour	5
Humber Bay	16
Toronto Harbour	10
Eastern Headland	5
Ashbridges Bay	2
East Side of the Headland	4
Scarborough Bluffs	3
Bluffers Park	2
Frenchman Bay	5
INTERCONNECTING CHANNELS*	
St. Clair River	8
Niagara River	9
St. Marys River	8
St. Lawrence River (near Wolfe Island)	5

* The Detroit River was not included in the Phase 1 studies.

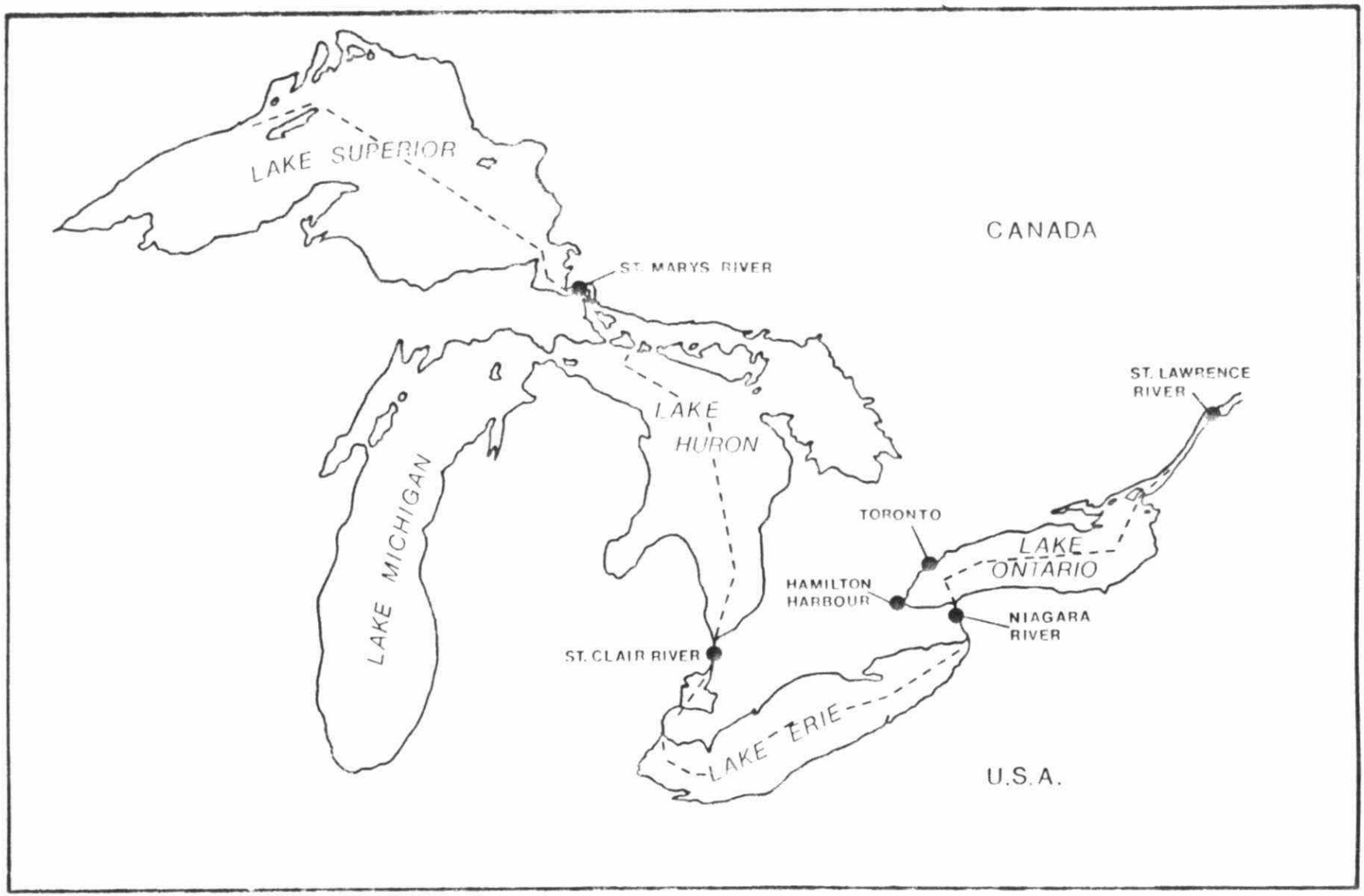

FIGURE 1.1 : PHASE 1 STUDY AREAS

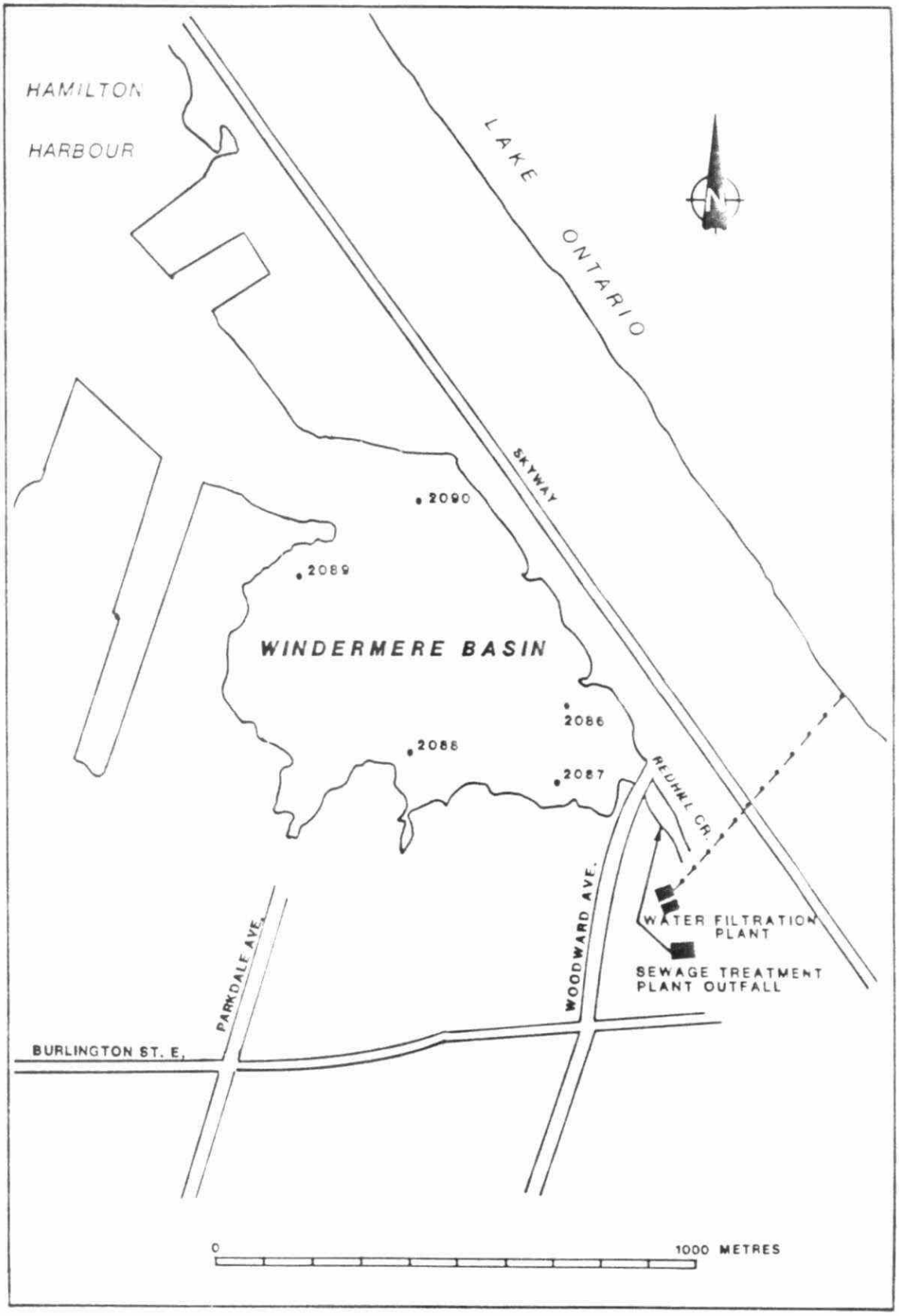

FIGURE 1.2 : STATION LOCATIONS- WINDERMERE BASIN

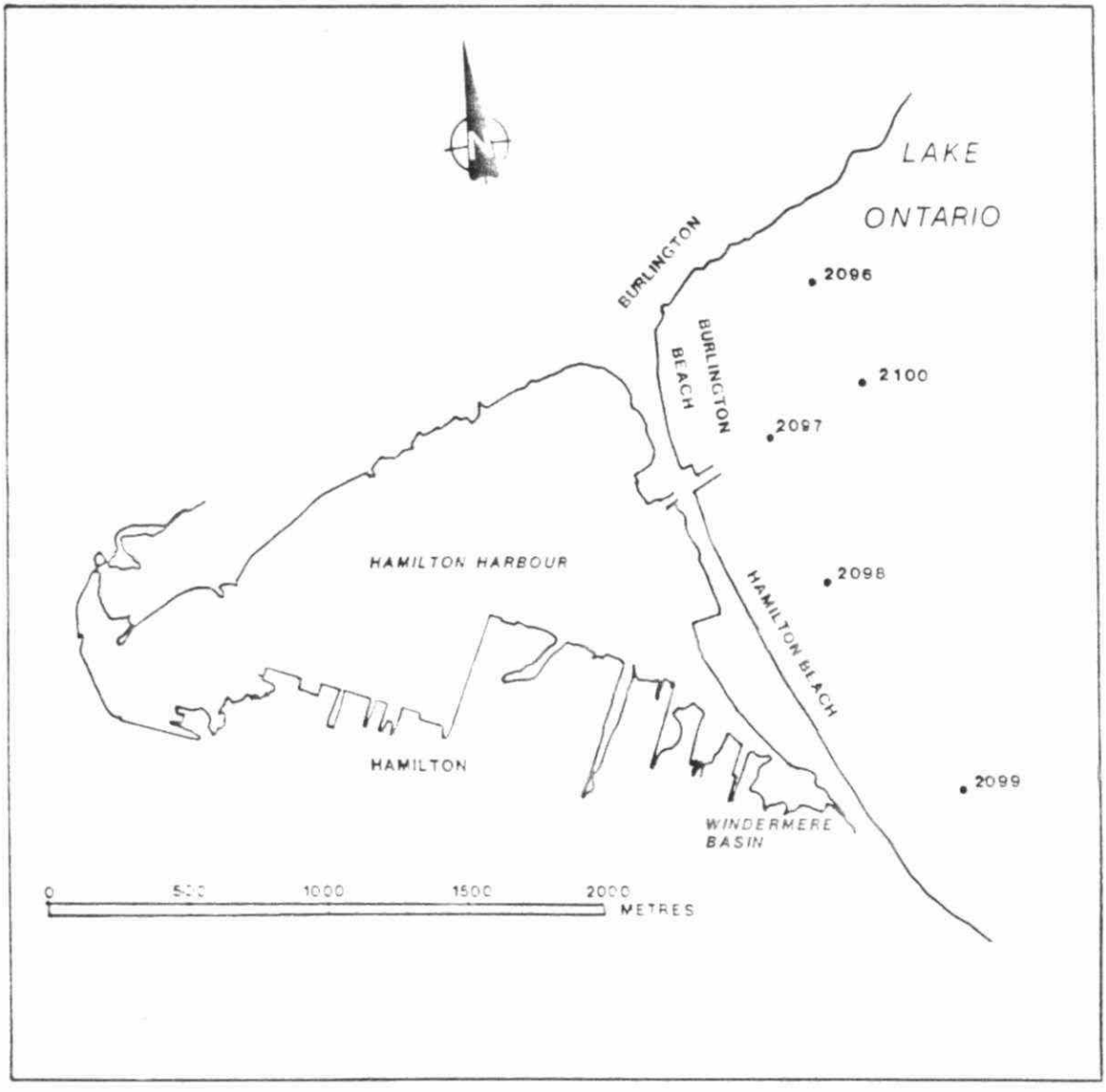

FIGURE 1.3: STATION LOCATIONS- OUTSIDE HAMILTON HARBOUR

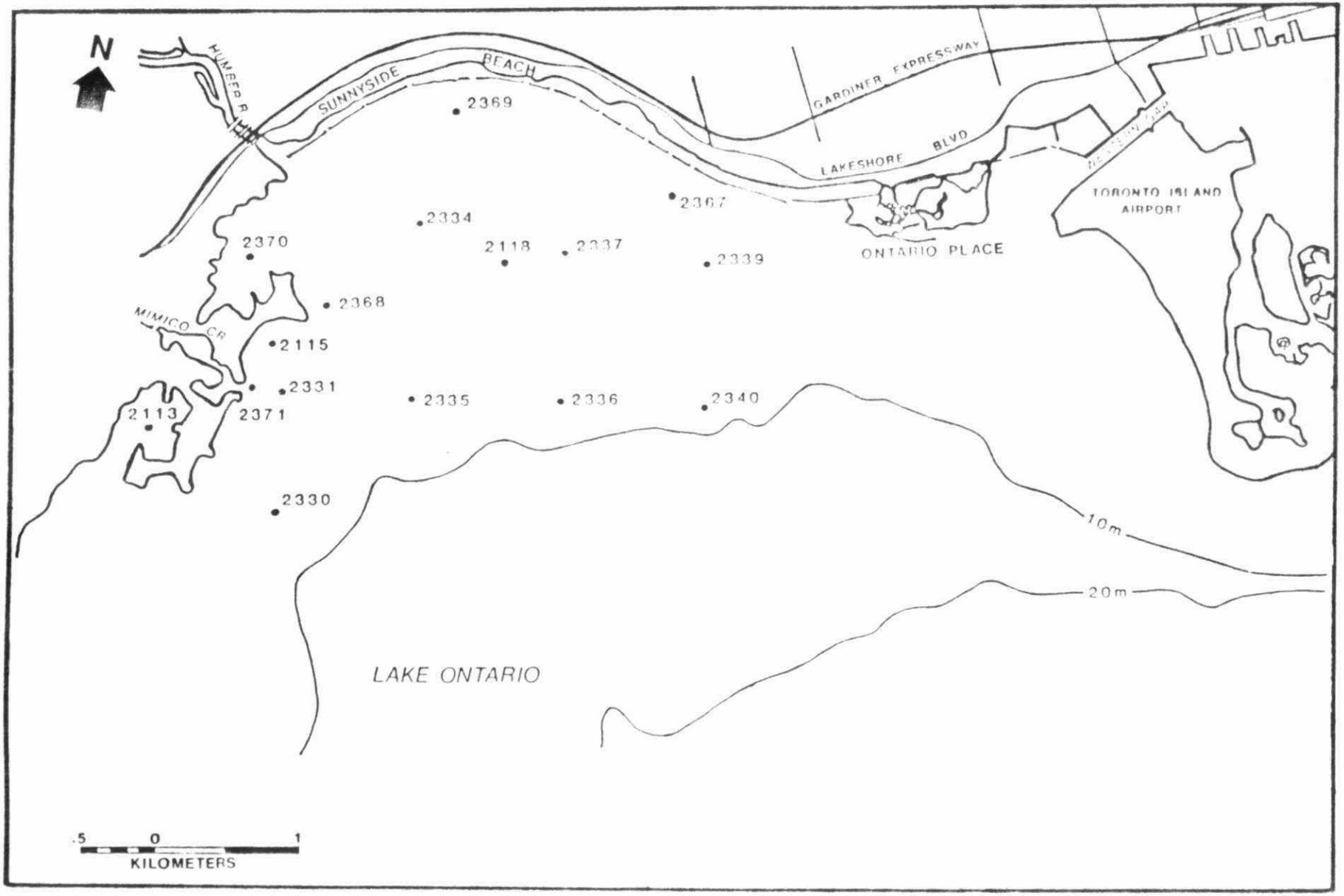

FIGURE 1.4 : STATION LOCATIONS- HUMBER BAY

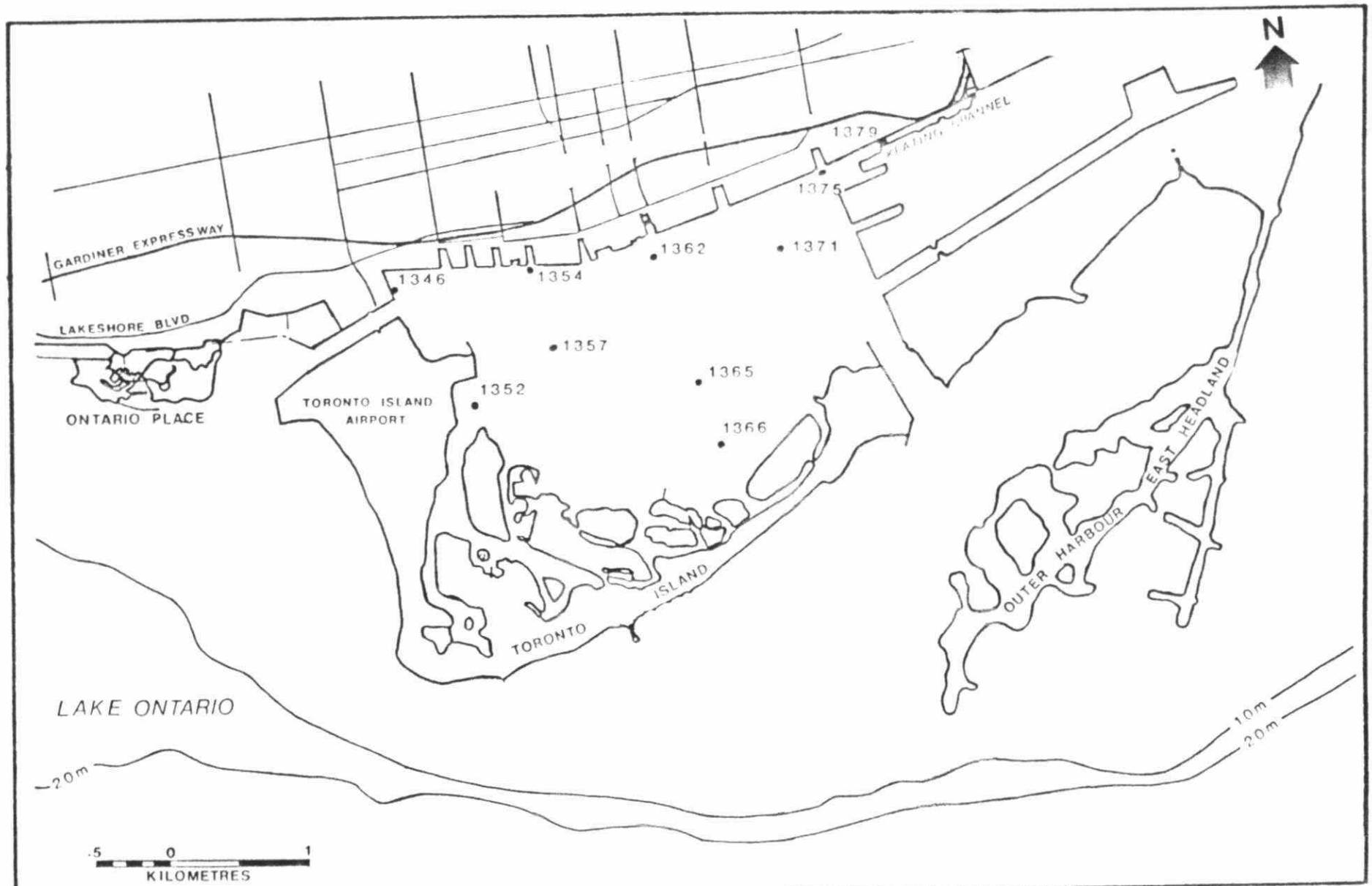

FIGURE 1.5 : STATION LOCATIONS- TORONTO HARBOUR

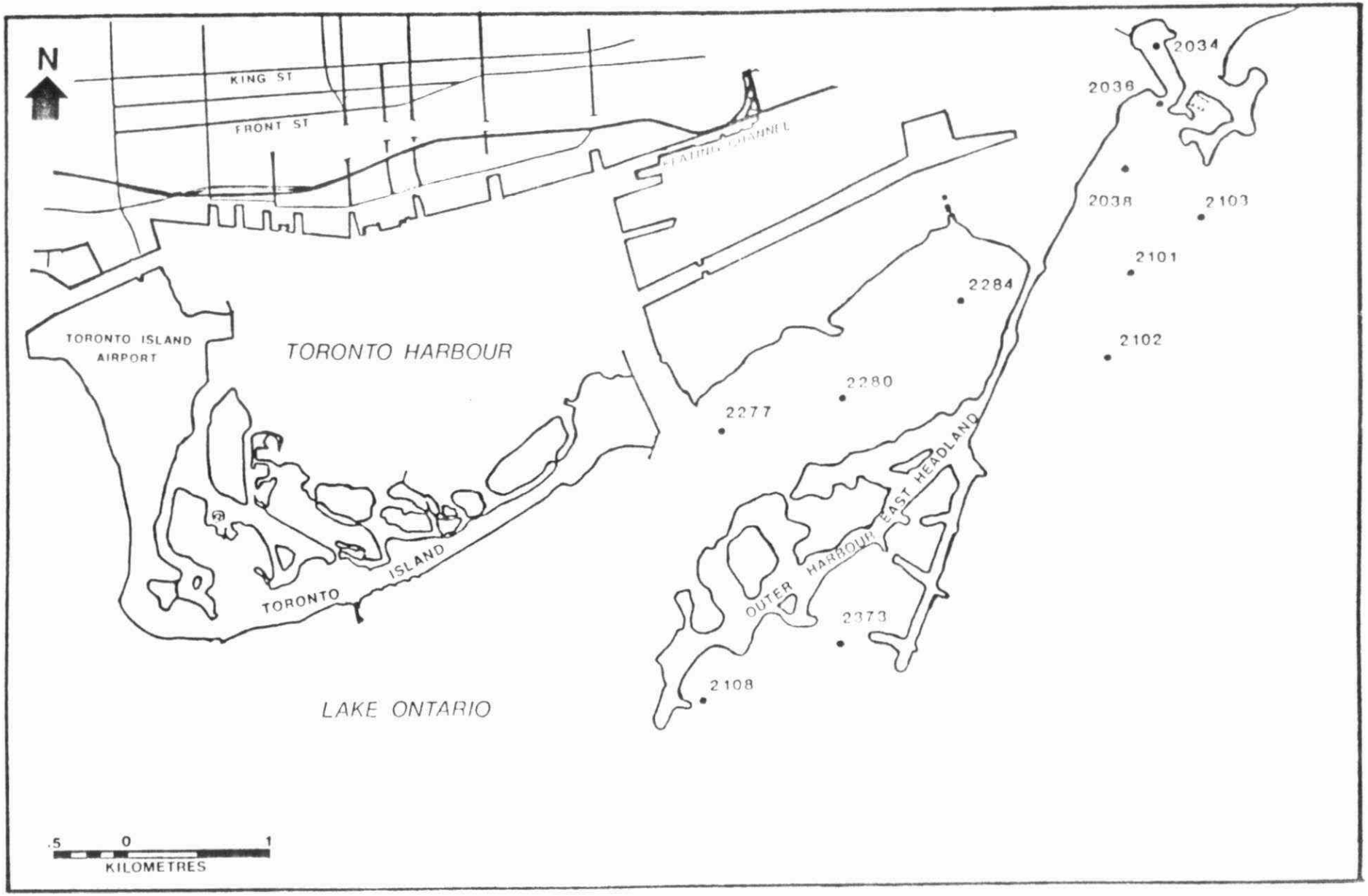

FIGURE 1.6 : STATION LOCATIONS- EASTERN HEADLAND AND ASHBRIDGES BAY

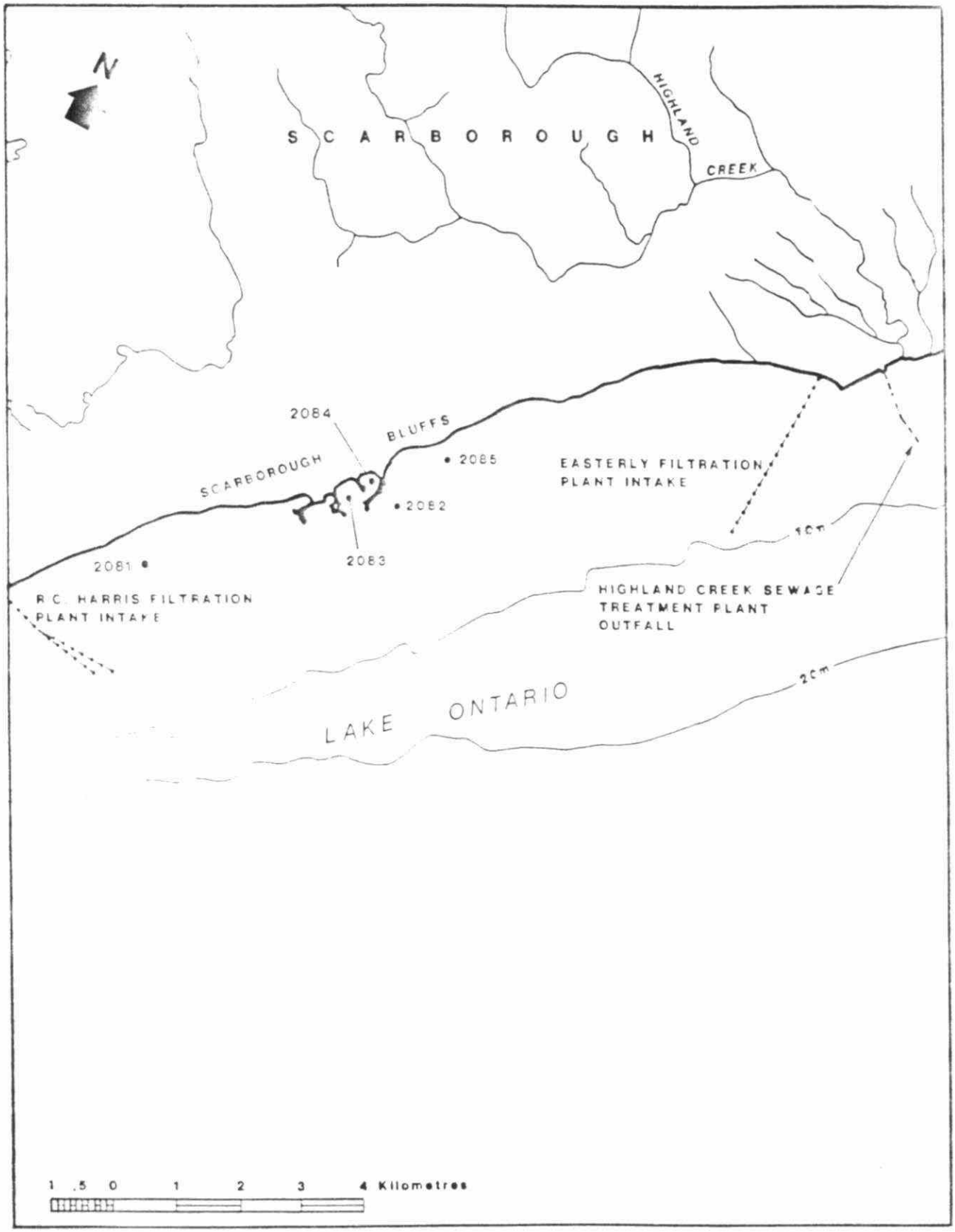

FIGURE 1.7 : STATION LOCATIONS- SCARBOROUGH BLUFFS

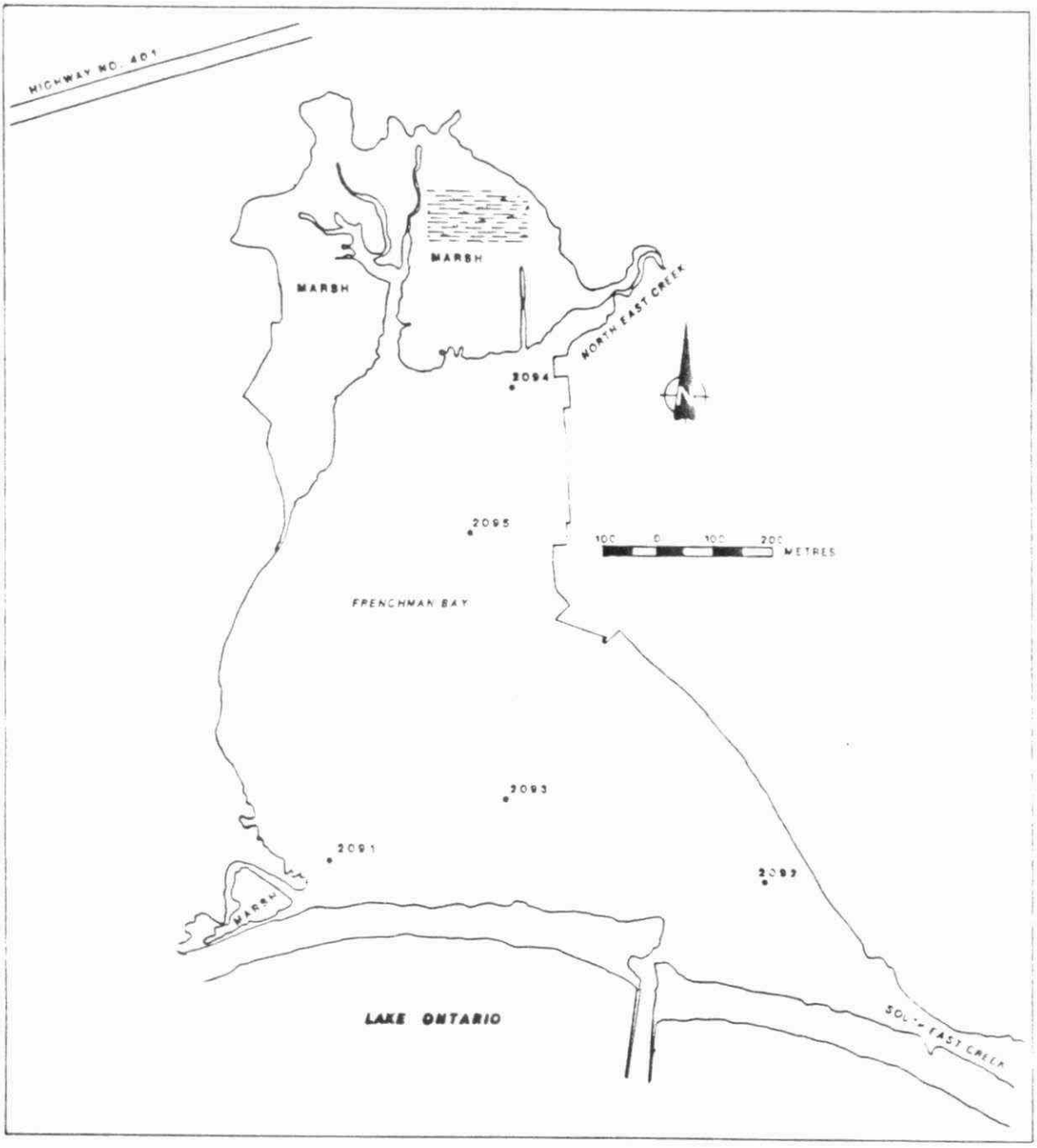

FIGURE 1.8 : STATION LOCATIONS- FRENCHMAN BAY

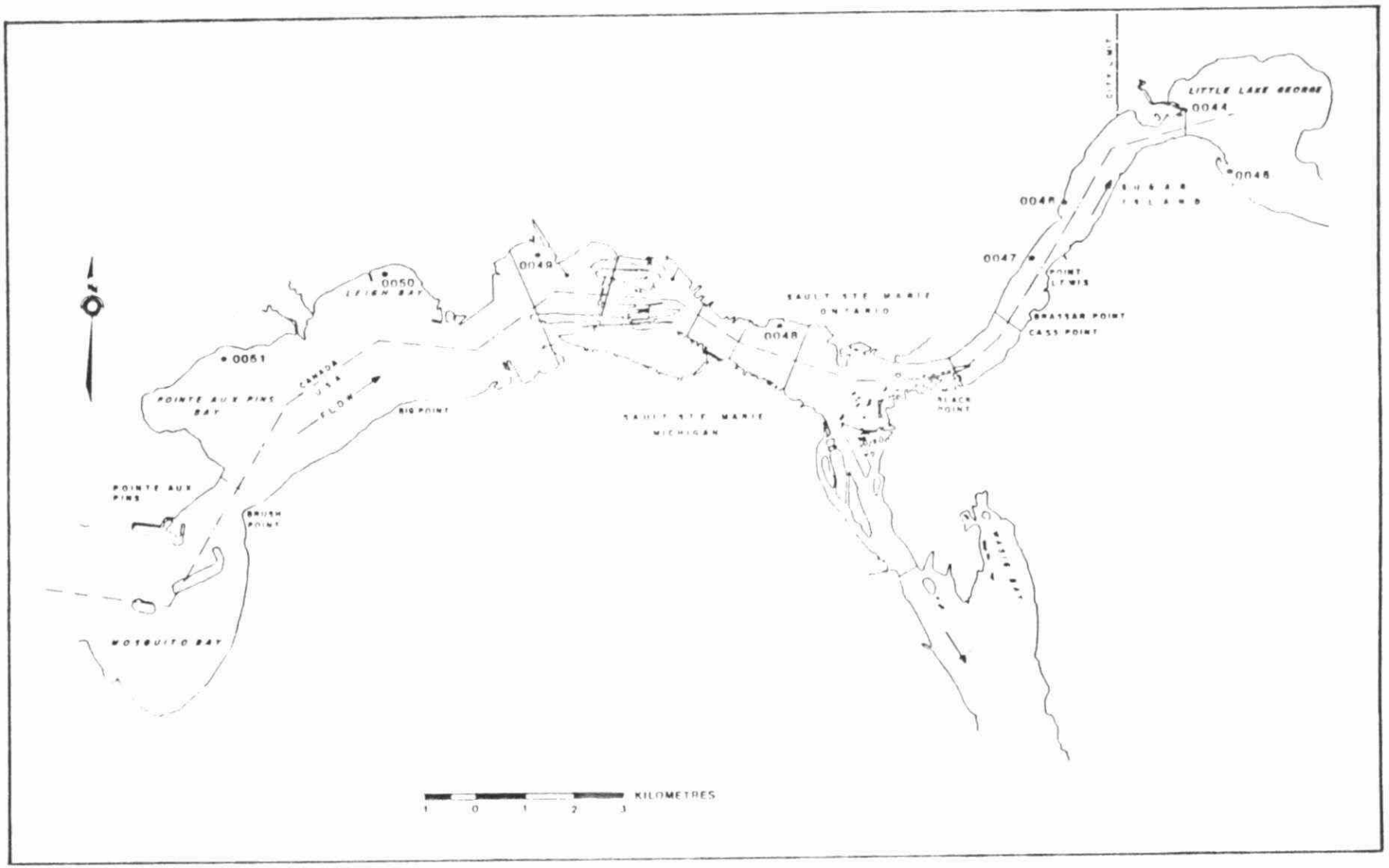

FIGURE 1.9 : STATION LOCATIONS- ST. MARYS RIVER

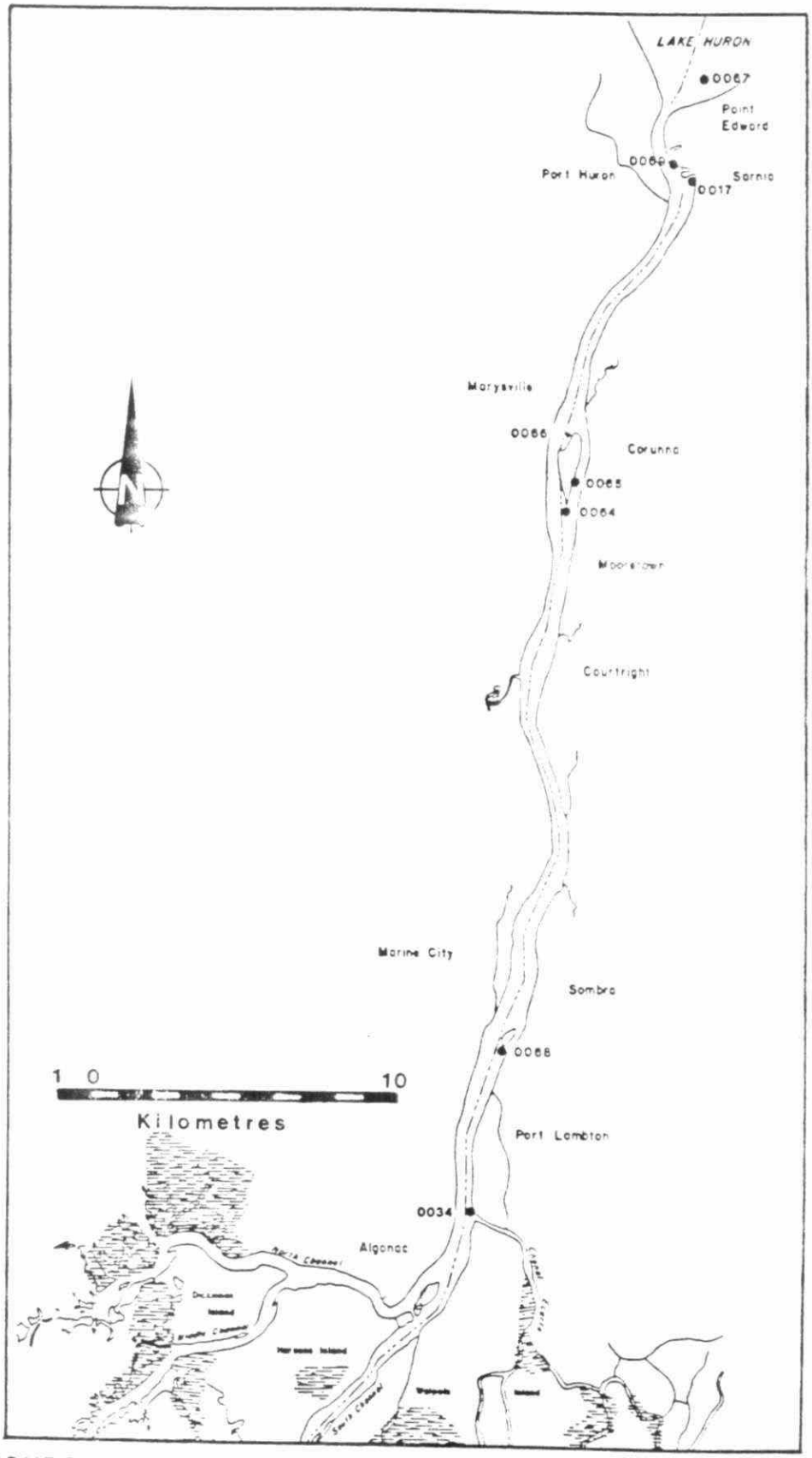

FIGURE 1.10 : STATION LOCATIONS- ST. CLAIR RIVER

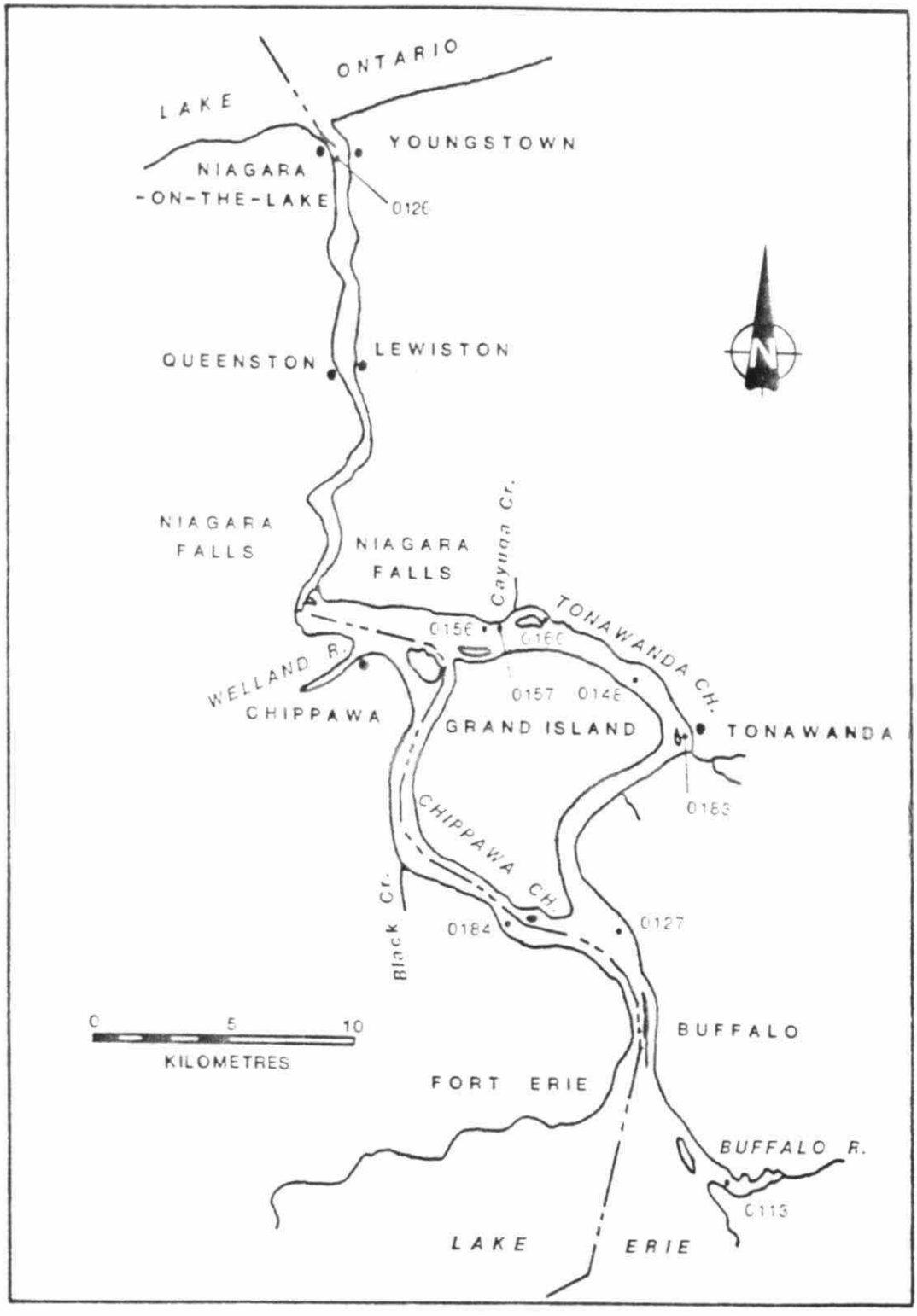

FIGURE 1.11: STATION LOCATIONS- NIAGARA RIVER

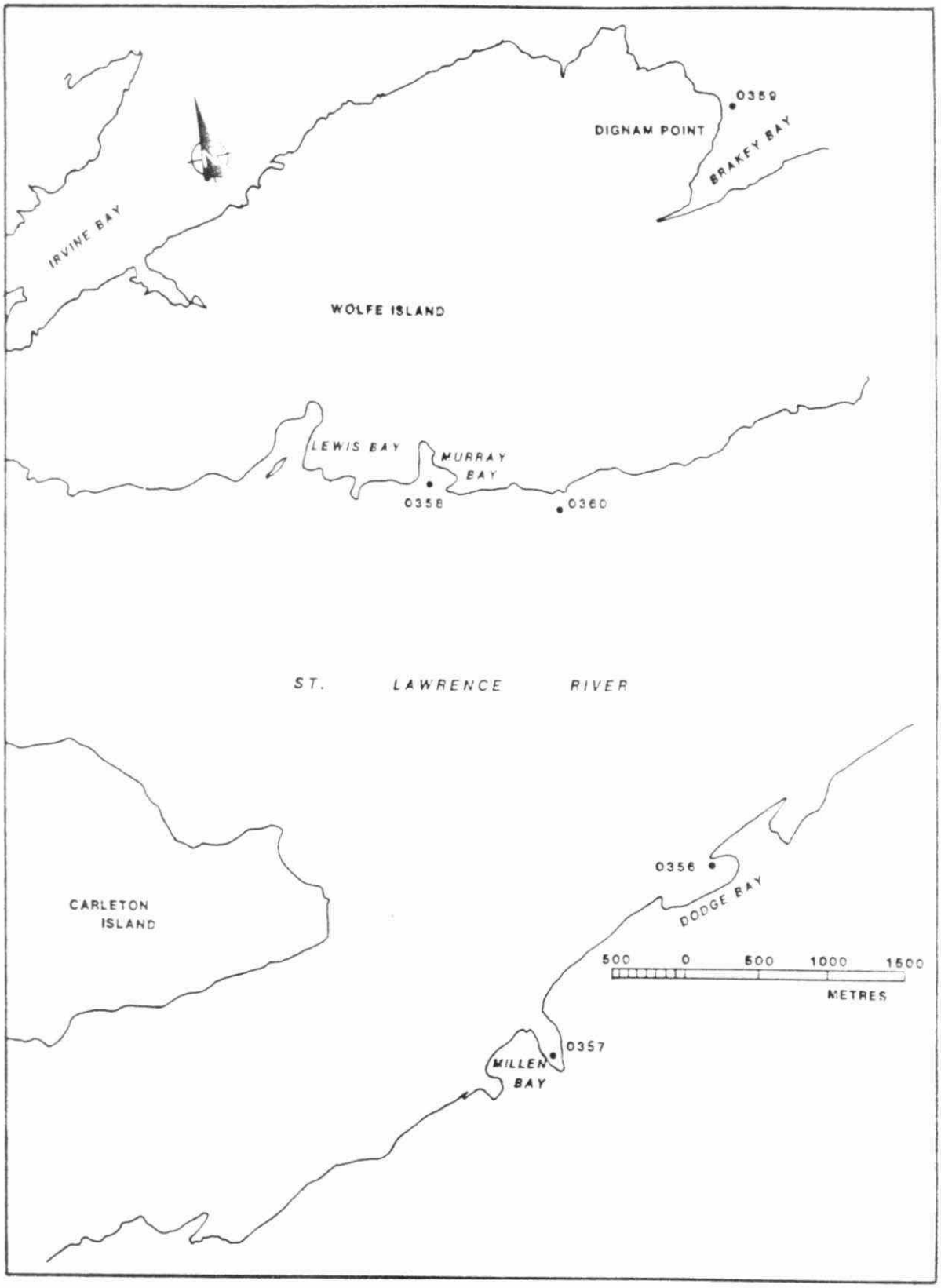

FIGURE 1.12 : STATION LOCATIONS- ST. LAWRENCE RIVER

2.0 SEDIMENT CHEMISTRY RESULTS

2.1 Bulk Analysis

Sediment collection was carried out using a 23 cm x 23 cm, Ponar grab sampler. Sample jars were filled with the top 5 cm of sediment from the Ponar. pH and Eh readings were taken for each sediment sample in the field with a Corning pH and Eh meter. Sediment samples were kept at 4°C and submitted to the MOE Rexdale laboratory for bulk chemical analyses on the entire sediment matrix. The bulk chemical analyses included loss on ignition, total Kjeldahl nitrogen, total organic carbon, total phosphorus, chromium, iron, manganese, mercury, cadmium, zinc, copper, lead, arsenic and solvent extractables (oil and grease) (Table 2.1) and PCBs and pesticides (Table 2.2). Analytical procedures are summarized below and can be found in detail in OMOE (1983).

Nutrients

The analysis of total Kjeldahl nitrogen and total phosphorus was carried out simultaneously using a Hot Plate digestion - colorimetry method. A sample aliquot is digested on a hot plate digester using a highly acidic media. The sample is then neutralized in two stages, and then analyzed using phenate-hypochlorite colorimetry.

Trace Metals

The metals are analyzed using dissolution in aqua-regia (i.e., nitric/hydrochloric, 2:1 acid digestion). Concentrations are then determined by atomic absorption spectroscopy.

Solvent Extractables

This is a "catch-all" category which includes petroleum hydrocarbons and hydrocarbons of a biogenic origin, such as fats and greases. The wet sample is extracted with methylene chloride and the resultant extract evaporated and the residue weighed (gravimetric method).

Total Organic Carbon

TOC is reported by analysis of total carbon and carbonate. Total carbon is determined using a Leco Carbon Analyser which combusts the sample in oxygen, oxidizing carbon to CO_2. The CO_2 is collected and then measured by an infrared detector. Carbonate is determined by coulometry and this measurement is subtracted from the total carbon measurement to give total organic carbon.

Loss of Weight on Ignition

LOI provides a rapid estimate of the organic component of the sample. Samples are dried, weighed and then heated in a muffle furnace at 475°C for four hours. The LOI is the weight lost during combustion, reported as a per cent of the original (dried) weight.

2.2 PCBs and Pesticides Analysis

The sample is extracted with distilled-in-glass acetone and hexane, concentrated, cleaned with mercury to remove sulphur compounds and the PCB fraction separated from the pesticide fraction by liquid chromatography using a Florisil column. The extracts are reduced in volume and analyzed using gas chromotography with an electron capture detector. The method is detailed in OMOE (1983).

Table 2.1 - Bulk Analysis of Sediment (Units based on dry weight)

Station	FIELD PH	FIELD EH	% LOI	TP mg/g	TKN mg/g	TOC mg/g	Cu ug/g	Cr ug/g	Hg ug/g	Cd ug/g	Fe ug/g	Pb ug/g	Zn ug/g	As ug/g	Mn ug/g	Solvent Extractables ug/g
Windermere Basin																
2086	6.96	-520	13.0*	6.9*	4.7*	67.0*	270.0*	510.0*	0.32*	4.10*	35000*	330.0*	1400 *	14.50*	780	15320*
2087	6.87	-490	12.0*	4.0*	4.0*	43.0*	140.0*	250.0*	0.28	2.40*	30000*	200.0*	650 *	11.20*	670	23120*
2088	6.86	-510	15.0*	6.3*	6.1*	59.0*	230.0*	440.0*	0.33*	4.10*	33000*	300.0*	1100 *	13.00*	670	22780*
2089	6.69	-460	17.0*	9.9*	5.5*	53.0*	430.0*	900.0*	0.48*	9.80*	38000*	340.0*	2800 *	15.40*	820	24410*
2090	6.87	-520	15.0*	7.7*	4.7*	68.0*	260.0*	590.0*	0.35*	5.80*	33000*	570.0*	1400 *	11.70*	700	16830*
Outside Hamilton Harbour																
2096	7.06	-125	3.0	0.9	0.8	11.0*	41.0*	43.0*	0.06	0.69	23000*	56.0*	170 *	5.88	500	950
2097	5.18	+ 80	1.9	0.7	0.4	3.6	11.0	20.0	0.01	0.32	16000*	23.0	90	5.03	560	520
2098	4.35	-135	2.0	0.8	0.5	5.3	23.0	25.0*	0.02	0.35	20000*	31.0	110 *	5.32	770	580
2099	6.22	-140	2.2	0.8	0.5	5.5	23.0	24.0	0.16	0.25	20000*	27.0	94	5.63	770	620
2100	6.01	-180	4.8	0.9	1.2	15.0*	41.0*	44.0*	0.08	0.69	24000*	55.0*	170 *	7.75	650	1560*
Humber Bay																
2113	7.73	-120	5.7	1.3*	1.6	-	120.0*	90.0*	0.20	3.20*	33000*	170.0*	300 *	6.66	570	4810*
2115	7.36	-130	12.0*	5.7*	4.4*	-	240.0*	450.0*	0.71*	18.00*	32000*	160.0*	870 *	6.00	510	13330*
2118	7.94	-110	4.1	1.2*	1.4	-	70.0*	93.0*	0.27	3.20*	27000*	98.0*	190 *	4.27	450	1140
2330	6.97	- 75	3.3	1.8*	1.4	12.0*	42.0*	77.0*	0.11	2.90*	16000*	61.0*	170 *	4.72	280	2900*
2331	6.78	-100	6.1*	3.0*	2.3*	25.0*	130.0*	230.0*	0.28	9.00*	28000*	190.0*	500 *	8.12*	500	4150*
2334	6.95	-155	3.8	2.2*	1.7	14.0*	39.0*	60.0*	0.05	2.10*	21000*	65.0*	160 *	3.83	500	1530*
2335	6.89	-125	5.4	2.5*	1.9	22.0*	88.0*	180.0*	0.26	5.00*	26000*	170.0*	320 *	6.68	460	3550*
2336	7.27	- 65	4.7	1.0*	1.1	13.0*	46.0*	48.0*	0.08	1.20*	23000*	60.0*	120 *	4.94	420	930
2337	7.32	+ 20	6.0*	0.9	1.2	15.0*	46.0*	49.0*	0.11	0.93	24000*	53.0*	120 *	7.54	450	880
2339	6.94	+ 10	1.4	0.4	0.3	3.0	4.1	12.0	0.02	<0.30	5400	18.0	32	1.50	120	560
2340	7.14	+175	5.3	1.0*	1.1	16.0*	62.0*	89.0*	0.20	2.20*	22000*	130.0*	180 *	5.94	400	1960*
2367	6.77	+ 26	1.0	0.8	0.3	2.8	180.0*	51.0*	0.02	4.70*	5300	11.0	27	1.15	120	510
2368	6.57	- 75	6.7*	4.4*	4.0*	31.0*	100.0*	210.0*	0.53*	8.50*	24000*	100.0*	440 *	4.29	540	8880*
2369	6.65	-150	3.2	1.7*	1.1	12.0*	55.0*	95.0*	0.11	3.60*	17000*	100.0*	210 *	2.65	360	2540*
2370	7.12	-135	7.2*	4.1*	3.5*	-	160.0*	320.0*	0.46*	13.00*	27000*	140.0*	630 *	3.12	480	6510*
2371	7.42	-100	3.8	1.3*	1.2	-	54.0*	80.0*	0.09	2.40*	24000*	130.0*	210 *	3.65	510	3500*
MOE Guidelines			6.0	1.0	2.0	10.0**	25.0	25.0	0.30	1.00	10000	50.0	100	8.00	-	1500

* Equals or exceeds MOE Guidelines for open water Disposal of Dredged Material

\- No data

** Interim Guideline

< Lower than detection limit

Table 2.1 (Cont'd.) - Bulk Analysis of Sediment (Units based on dry weight)

Station	PH	FIELD EH	% LOI	TP mg/g	TKN mg/g	TOC mg/g	Cu ug/g	Cr ug/g	Hg ug/g	Cd ug/g	Fe ug/g	Pb ug/g	Zn ug/g	As ug/g	Mn ug/g	Solvent Extractables ug/g
Toronto Harbour																
1346 S	6.60	-110	5.5	1.7*	1.3	39.0*	86.0*	57.0*	2.10*	3.90*	17000*	460.0*	310 *	5.12	300	7910*
1352 IH	6.81	-125	11.0*	1.8*	2.7*	31.0*	110.0*	130.0*	0.20	5.00*	31000*	270.0*	420 *	9.94*	520	5520*
1354 S	6.80	+ 25	6.6*	2.3*	2.3*	30.0*	110.0*	120.0*	0.68*	4.70*	26000*	300.0*	370 *	7.06	460	7960*
1357 IH	6.76	- 22	6.7*	2.2*	2.3*	29.0*	99.0*	130.0*	0.43*	5.40*	31000*	290.0*	400 *	9.81*	510	4210*
1362 S	7.01	+200	5.2	1.9*	1.9	26.0*	79.0*	81.0*	0.18	3.40*	28000*	240.0*	310 *	5.94	510	4080*
1365 IH	6.92	-150	8.4*	1.5*	1.8	24.0*	95.0*	110.0*	0.22	4.30*	30000*	280.0*	370 *	8.90*	520	4000*
1366 IH	6.95	-150	9.3*	1.3*	1.3	30.0*	110.0*	120.0*	0.30*	5.40*	31000*	280.0*	380 *	9.70*	500	4100*
1371 IH	6.76	- 20	5.8	1.9*	2.1*	25.0*	79.0*	82.0*	0.20	3.60*	29000*	220.0*	320 *	6.58	510	7610*
1375 S	6.76	-120	4.7	1.7*	1.8	23.0*	54.0*	44.0*	0.15	1.70*	21000*	160.0*	220 *	3.51	450	2230*
1379 S	6.76	-135	9.4*	1.8*	3.3*	37.0*	76.0*	49.0*	0.20	1.90*	23000*	210.0*	290 *	3.20	650	9270*
(S=boat slip, IH=inner Toronto Harbour)																
Eastern Headland																
2108	7.24	- 70	0.9	0.6	0.3	-	11.0	14.0	0.06	0.62	9600	20.0	52	1.39	210	610
2284	7.49	-200	6.8*	1.3*	1.6	-	71.0*	71.0*	0.29	2.20*	33000*	170.0*	230 *	11.69*	450	2310*
2280	7.53	-120	2.1	0.8	0.7	-	27.0*	35.0*	0.11	0.70*	21000*	61.0*	81	2.86	370	3330*
2277	7.27	-200	3.7	0.9	1.2	-	52.0*	61.0*	0.18	1.60*	26000*	110.0*	170 *	5.68	370	2150*
2373	7.75	- 90	2.6	0.9	0.7	-	31.0*	50.0*	0.22	2.60*	18000*	56.0*	110 *	3.46	390	1230
Ashbridges Bay																
2034	6.78	-190	9.3*	4.4*	2.7*	50.0*	220.0*	180.0*	0.70*	4.80*	24000*	560.0*	540 *	5.68	450	13210*
2036	6.94	- 19	0.5	0.8	0.2	2.5	17.0	38.0*	0.03	0.40	5800	62.0*	61	1.18	140	710
East Side of the Headland																
2038	6.08	0	1.0	1.3*	0.4	7.5	16.0	41.0*	0.02	0.42	12000*	26.0	61	1.47	230	930
2101	6.94	-115	0.6	0.6	0.2	0.0	4.5	7.6	0.01	<0.20	4700	<3.0	15	0.93	170	870
2102	5.64	+430	0.6	0.6	0.2	2.6	4.5	9.0	0.02	0.20	7400	6.0	17	1.50	220	1360
2103	7.28	+310	0.3	0.8	0.2	0.1	3.7	8.1	0.01	<0.20	4900	3.0	14	0.85	140	460
Scarborough Bluffs																
2081	7.04	+320	2.6	2.1*	0.2	0.1	<2.0	14.0	0.01	0.30	15000*	3.2	18	1.27	270	210
2082	7.41	+ 70	1.5	1.1*	0.6	7.0	12.0	22.0	0.02	0.30	15000*	11.0	44	2.02	330	360
2085	7.29	+315	0.5	0.7	0.3	3.0	5.7	13.0	0.01	0.68	8100	5.5	21	2.29	250	180
Bluffers Park																
2083	7.15	- 75	3.4	1.2*	0.9	10.0*	23.0	36.0*	0.05	0.84	23000*	66.0*	83	5.89	470	820
2084	7.11	- 70	1.8	1.0*	0.6	7.8	12.0	23.0	0.02	0.30	16000*	27.0	43	2.71	360	480
MOE Guidelines			6.0	1.0	2.0	10.0**	25.0	25.0	0.30	1.00	10000	50.0	100	8.00	-	1500

* Equals or exceeds MOE Guidelines
< Lower than detection limit
\- No data
** Interim Guideline

Table 2.1 (Cont'd.) - Bulk Analysis of Sediment (Units based on dry weight)

Station	PH	FIELD EH	% LOI	TP mg/g	TKN mg/g	TOC mg/g	Cu ug/g	Cr ug/g	Hg ug/g	Cd ug/g	Fe ug/g	Pb ug/g	Zn ug/g	As ug/g	Mn ug/g	Solvent Extractables ug/g
Frenchman Bay																
2091	6.67	- 85	14.0*	0.7	5.2*	51.0*	37.0*	25.0*	0.04	58.00*	15000*	44.0	79	7.60	500	1830*
2092	6.99	-125	19.0*	1.1*	4.9*	55.0*	41.0*	49.0*	0.06	1.20*	26000*	76.0*	140 *	16.10*	710	1600*
2093	7.57	-110	5.7	0.6	0.8	18.0*	15.0	16.0	0.02	0.53	10000*	23.0	56	3.49	250	840
2094	7.07	- 80	20.0*	1.0*	5.8*	74.0*	26.0*	33.0*	0.06	0.73	22000*	53.0*	120 *	6.98	430	2810*
2095	7.08	-110	29.0*	1.0*	5.9*	82.0*	38.0*	37.0*	0.06	0.89	23000*	72.0*	130 *	8.74*	610	2760*
St. Clair River																
0017	6.94	- 60	1.8	0.2	0.5	-	20.0	16.0	2.20*	0.40	11000*	44.0	62	3.80	210	1350
0034	6.65	-150	2.0	0.3	0.4	-	15.0	11.0	1.50*	0.25	9800	24.5	43	1.97	170	940
0064	6.92	-200	2.5	0.3	0.9	-	16.0	16.0	0.04	0.45	11000*	11.5	56	2.98	220	890
0065	6.66	-125	2.0	0.2	0.8	-	12.5	14.0	0.12	0.45	9900	8.5	48	3.31	180	1060
0066	6.75	-160	2.0	0.2	0.5	-	8.5	12.0	0.02	0.30	8100	7.5	37	4.16	180	920
0067	7.13	+230	1.5	0.1	<0.1	-	5.0	8.8	<0.01	<0.20	5300	6.0	20	5.07	160	350
0068	7.01	-210	2.6	0.3	0.5	-	13.0	11.0	0.94*	0.30	8800	20.0	44	2.66	190	930
0069	6.16	-120	6.9*	0.4	1.0	-	33.0*	16.0	0.45*	1.90*	10000*	108.0*	130 *	2.22	430	5930*
Niagara River																
0113	6.54	-150	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0126	7.02	-110	1.7	0.6	0.6	-	15.0	19.0	0.04	0.30	13000*	15.0	82	2.20	250	1080
0127	6.88	-340	0.7	0.5	0.3	2.1	54.0*	32.0*	0.91*	1.20*	14000*	26.0	100 *	0.57	-	-
0148	7.20	+ 85	-	0.6	1.1	11.0*	17.0	20.0	0.07	0.45	18000*	16.0	82	3.75	-	-
0156	6.70	+ 20	4.2	0.8	1.0	-	38.0*	39.0*	1.00*	1.40*	16000*	51.0*	230 *	3.40	240	1850*
0157	6.35	-260	8.4*	0.7	1.0	-	32.0*	37.0*	1.50*	1.50*	16000*	62.0*	330 *	5.70	230	2930*
0160	6.73	-120	1.3	0.7	0.4	-	10.0	10.0	2.00*	0.65	9400	14.0	140 *	1.30	105	3060*
0183	6.75	-370	15.0*	0.6	0.8	-	52.0*	22.0	0.22	1.20*	23000*	50.0*	240 *	5.30	300	2360*
0184	6.59	-480	2.3	0.6	0.7	-	10.0	15.0	0.01	0.25	9800	10.0	46	1.60	290	720
St. Marys River																
0044	6.35	-100	3.4	0.5	1.0	-	17.0	25.0*	0.05	0.00	18000*	17.0	70	-	200	2130*
0045	6.50	+160	3.7	0.4	1.3	-	13.0	27.0*	0.06	0.00	17000*	28.0	76	-	190	910
0046	5.87	-180	16.0*	1.2*	3.8*	-	92.0*	77.0*	0.33*	0.65	58000*	130.0*	430 *	-	800	14910*
0047	6.39	-100	8.8*	0.8	3.2*	-	56.0*	54.0*	0.30*	0.50	34000*	75.0*	270 *	-	390	5730*
0048	6.14	- 80	15.0*	0.7	2.6*	-	96.0*	86.0*	0.31*	1.30*	59000*	320.0*	510 *	-	850	22180*
0049	7.60	-280	11.0*	0.2	0.5	-	13.0	51.0*	0.06	0.00	80000*	54.0*	300 *	-	1500	2570*
0050	7.44	- 45	0.4	0.2	0.2	-	3.5	8.2	<0.01	0.00	7300	<5.0	19	-	88	460
0051	7.15	+ 95	1.3	0.2	0.4	-	3.2	8.0	<0.01	0.00	7400	5.5	22	-	88	280
MOE Guidelines			6.0	1.0	2.0	10.0**	25.0	25.0	0.30	1.00	10000	50.0	100	8.00	-	1500

* Equals or exceeds MOE Guidelines
< Lower than detection limit
- No data
** Interim Guideline

Table 2.1 (Cont'd.) - Bulk Analysis of Sediment (Units based on dry weight)

Station	FIELD PH	FIELD EH	% LOI	TP mg/g	TKN mg/g	TOC mg/g	Cu ug/g	Cr ug/g	Hg ug/g	Cd ug/g	Fe ug/g	Pb ug/g	Zn ug/g	As ug/g	Mn ug/g	Solvent Extractables ug/g
St. Lawrence River																
0356	6.04	+100	0.1	0.9	0.2	-	1.0	11.0	0.01	<0.30	12000*	<5.0	10	2.60	110	230
0357	4.25	-470	9.8*	0.6	3.4*	-	19.0	21.0	0.08	0.45	10000*	22.0	71	-	170	1380
0358	6.92	-110	4.6	0.7	2.4*	-	7.4	14.0	0.05	<0.30	7500	10.0	33	-	110	980
0359	7.88	-120	6.3*	0.4	2.7*	-	24.0	23.0	0.01	<0.30	14000*	11.0	43	-	230	1020
0360	7.42	-310	2.5	0.6	0.9	-	11.0	17.0	0.08	<0.30	13000*	15.0	49	-	170	3460*
MOE Guidelines			6.0	1.0	2.0	10.0**	25.0	25.0	0.30	1.00	10000	50.0	100	8.00	-	1500

* Equals or exceeds MOE Guidelines
\- No data
** Interim Guideline
< Lower than detection limit

Table 2.2 - Pesticides Analysis of Sediment (units based on dry weight, ng/g)

Station	PCBs	Aldrin	A-BHC-Hexa-Chlorocyclo Hexane	B-BHC Hexa-Chlorocyclo Hexane	G-BHC Hexa-Chlorocyclo Hexane	alpha Chlordane	gamma Chlordane	Dieldrin	DMDT Methoxychlor	Endosulfan I
Windermere Basin										
2086	385*	<1	<1	<1	<1	4	5	6	<5	<2
2087	480*	<1	<1	<1	<1	14	10	10	<5	<2
2088	770*	<1	<1	<1	<1	25	15	7	<5	<2
2089	1015*	<1	<1	<1	<1	45	22	6	<5	<2
2090	3090*	<1	<1	<1	<1	25	30	2	<5	<2
Outside										
Hamilton Harbour										
2096	50*	<1	<1	<1	<1	<2	<2	4	<5	<2
2097	<20	<1	<1	<1	<1	<2	<2	3	<5	<2
2098	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2099	45	<1	<1	<1	<1	<2	<2	<2	<5	<2
2100	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
Humber Bay										
2113	135*	<1	<1	<1	<1	5	7	<2	70	<2
2115	235*	<1	<1	<1	<1	10	10	<2	40	<2
2118	310*	<1	<1	<1	<1	3	3	<2	<5	<2
2330	190*	<1	<1	<1	<1	<2	<2	2	<5	<2
2331	115*	<1	<1	<1	<1	5	6	7	<5	3
2334	30	<1	<1	<1	<1	2	<2	<2	<5	<2
2335	30	<1	<1	<1	<1	<2	<2	<2	<5	<2
2336	120*	<1	<1	<1	<1	<2	<2	2	<5	<2
2337	60*	<1	<1	<1	<1	<2	<2	5	<5	<2
2339	20	<1	<1	<1	<1	<2	<2	23	<5	4
2340	300*	<1	<1	<1	<1	<2	<2	<2	<5	<2
2367	35	<1	<1	<1	<1	<2	<2	5	<5	<2
2368	45	2	<1	<1	<1	10	10	<2	<5	<2
2369	50*	<1	<1	<1	<1	4	5	<2	<5	<2
2370	150*	<1	<1	<1	<1	5	6	<2	<5	<2
2371	195*	<1	<1	<1	<1	5	6	<2	<5	<2
Toronto Harbour										
1346	1300*	<1	<1	<1	<1	<2	<2	<2	<5	<2
1352 IH	590*	<1	<1	<1	<1	<2	<2	<2	<5	<2
1354 S	350*	<1	<1	<1	<1	<2	<2	<2	<5	<2
1357 IH	150*	<1	<1	<1	<1	5	5	<2	<5	<2
1362 IH	110*	<1	<1	<1	<1	<2	<2	<2	<5	<2
1365 IH	115*	<1	<1	<1	<1	<2	<2	<2	<5	<2
1366 IH	180*	<1	<1	<1	<1	6	10	8	<5	<2
1371 IH	290*	<1	<1	<1	<1	5	5	<2	<5	<2
1375 S	100*	<1	<1	<1	<1	5	5	<2	<5	<2
1379 S	30	<1	<1	<1	<1	<2	<2	<2	<5	<2

(S=boat slips, IH=inner Toronto Harbour) < Lower than detection limit

* Equals or exceeds MOE Guidelines for open water Disposal of Dredged Material (PCBs 50 ng/g)

Table 2.2 (Cont'd.) - Pesticides Analysis of Sediment (Units based on dry weight, ng/g)

Station	Endo-sulfan II	Endrin	Endosulfan sulphate	Heptachlor epoxide	Heptachlor	Mirex	Oxychlor-dane	OP-DDT	PP-DDD	PP-DDE	PP-DDT	Hexachloro-benzene
Windermere Basin												
2086	<4	4	4	<1	<1	-	<2	<5	<5	61	<5	6
2087	<4	<4	<4	<1	<1	<5	<2	<5	5	31	5	3
2088	<4	15	<4	<1	<1	-	<2	<5	15	71	10	<1
2089	<4	<4	<4	<1	<1	-	<2	<5	25	<1	15	<1
2090	<4	<4	<4	<1	<1	-	<2	<5	50	96	25	<1
Outside Hamilton Harbour												
2096	<4	<4	<4	<1	<1	<5	<2	<5	5	12	<5	1
2097	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2098	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2099	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	10	<1
2100	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	15	<1
Humber Bay												
2113	<4	<4	10	<1	<1	<5	<2	<5	10	<1	<5	<1
2115	5	<4	15	<1	<1	<5	<2	<5	5	2	<5	3
2118	<4	<4	60	<1	<1	<5	<2	<5	20	<1	<5	1
2330	<4	<4	<4	<1	<1	<5	<2	<5	<5	5	<5	3
2331	<4	15	<4	<1	<1	<5	<2	<5	20	<1	<5	<1
2334	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2335	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2336	<4	<4	<4	<1	<1	<5	<5	<5	<5	2	<5	<1
2337	<4	10	<4	<1	<1	<5	<5	<5	15	<1	<5	<1
2339	17	114	<4	<1	<1	<5	<5	<5	<5	<1	<5	<1
2340	<4	<4	<4	<1	<1	<5	<5	<5	<5	<1	<5	<1
2367	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2368	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2369	<4	<4	<4	<1	<1	<2	<5	<5	<5	5	<5	<1
2370	<5	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	3
2371	5	<2	60	<1	<1	<5	<2	<5	<5	<1	<5	<1
Toronto Harbour												
1346	<4	<4	<4	<1	<1	<5	<2	<5	46	<1	10	2
1352 IH	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
1354 S	<4	<4	<4	<1	<1	<5	<2	<5	<5	5	<5	2
1357 IH	<4	<4	<4	<1	<1	<5	<2	<5	10	<1	30	<1
1362 IH	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
1365 IH	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
1366 IH	<4	35	<4	<1	<1	<5	<2	<5	20	<1	<5	<1
1371 IH	<4	<4	<4	<1	<1	<5	<2	<5	5	<1	<5	<3
1375 S	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
1379 S	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	1

(S = boat slips, IH = inner Toronto Harbour)
< Lower than detection limit

Table 2.2 (Cont'd.) - Pesticides Analysis of Sediment (Units based on dry weight, ng/g)

Station	PCBs	Aldrin	A-BHC Hexa-Chlorocyclo Hexane	B-BHC Hexa-Chlorocyclo Hexane	G-BHC Hexa-Chlorocyclo Hexane	A-Chlordane	G-Chlordane	Dieldrin	DMDT Methoxychlor	Endosulfan I
Eastern Headland										
2108	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2277	100*	<1	<1	<1	<1	2	3	<2	<5	<2
2280	220*	<1	<1	3	<1	3	5	<2	<8	<2
2284	220*	<1	<1	2	<1	4	3	<2	<5	<2
2373	70*	<1	<1	<1	<1	3	5	<2	5	<2
Ashbridges Bay										
2034	300*	<1	<1	<1	<1	<2	<2	7	19	<2
2036	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
East Side of the Headland										
2038	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2101	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2102	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2103	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
Scarborough Bluffs										
2081	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2082	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2085	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
Bluffers Park										
2083	<20	<1	<1	<1	<1	4	3	3	<5	<2
2084	<20	<1	<1	<1	<1	<2	<2	<8	<5	<2
Frenchman Bay										
2091	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2092	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
2093	35	<1	<1	<1	<1	<2	<2	<2	<5	<2
2094	25	<1	<1	<1	<1	<2	<2	<2	<5	<2
2095	25	<1	<1	<1	<1	<2	<2	5	<5	<2
St. Clair River										
0017	45	<1	<1	<1	<1	<2	<2	40	<5	<2
0034	60*	<1	<1	<1	<1	<2	<2	<2	<5	<2
0064	25	<1	<1	<1	<1	<2	<2	14	<5	<2
0065	30	<1	<1	<1	<1	<2	<2	8	<5	8
0066	35	<1	<1	<1	<1	<2	<2	14	<5	<2
0067	<20	<1	<1	<1	<1	<2	<2	22	<5	<2
0068	30	<1	<1	<1	<1	<2	<2	<2	<5	<2
0069	140*	<1	<1	<1	<1	<2	<2	<2	<5	20

< Lower than detection limit

* Equals or exceeds MOE Guidelines (PCBs 50 ng/g)

Table 2.2 (Cont'd.) - Pesticides Analysis of Sediment (Units based on dry weight, ng/g)

Station	Endo-sulfan II	Endrin	Endosulfan sulphate	Heptachlor epoxide	Heptachlor	Mirex	Oxychlor-dane	OP-DDT	PP-DDD	PP-DDE	PP-DDT	Hexachloro-benzene
Eastern Headland												
2108	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2277	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2280	<4	<4	<4	<1	<1	<5	<2	<5	10	<1	<10	2
2284	<4	<4	<4	<1	<1	<5	<2	<5	5	1	<5	1
2373	<4	<4	<4	<1	<1	<5	<2	<5	5	<1	<5	<1
Ashbridges Bay												
2034	<4	13	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2036	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
East Side of the Headland												
2038	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2101	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2102	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2103	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
Scarborough Bluffs												
2081	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2082	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2085	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
Bluffers Park												
2083	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2084	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
Frenchman Bay												
2091	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2092	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2093	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2094	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
2095	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	<1
St. Clair River												
0017	<4	6	<4	<1	<1	<5	<2	<5	<5	<1	<5	345
0034	<4	<4	<4	<1	<1	<5	<2	<5	<5	1	<5	142
0064	<4	<4	<4	<1	<1	<5	<2	<5	<5	2	<5	9
0065	<4	<4	<4	<1	<1	<5	<2	<5	<5	1	<5	8
0066	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	17
0067	<4	<4	<4	<1	<1	<5	<2	<5	<5	<1	<5	1
0068	<4	<4	<4	<1	<1	<5	<2	<5	<5	1	<5	360
0069	<4	50	<4	<1	<1	<5	<2	<5	<5	2	<5	6

< lower than detection limit

Table 2.2 (Cont'd.) - Pesticides Analysis of Sediment (Units based on dry weight, ng/g)

Station	PCBs	Aldrin	A-BHC Hexa-Chlorocyclo Hexane	B-BHC Hexa-Chlorocyclo Hexane	G-BHC Hexa-Chlorocyclo Hexane	A-Chlordane	G-Chlordane	Dieldrin	DMDT Methoxychlor	Endosulfan I
Niagara River										
0113	-	<1	<1	<1	<2	<2	<2	<2	<5	<2
0126	80*	<1	<1	<1	<2	<2	<2	<2	<5	<2
0127	<20	<1	<1	<1	<2	<2	<2	<2	<5	<2
0148	<20	<1	<1	<1	<1	<2	<1	15	<5	<2
0156	355*	<1	<5	<1	2	2	2	14	<5	18
0157	275*	<1	16	200	5	5	5	21	32	31
0160	130*	<1	612	454	<2	<2	<2	8	<5	<2
0183	205*	<1	<1	<1	3	<2	3	15	12	<2
0184	50*	<1	<1	<1	<2	<2	<2	<2	<5	<2
St. Marys River										
0044	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
0045	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
0046	100*	<1	<1	<1	<1	<2	<2	12	<5	<2
0047	90*	<1	<1	<1	<1	<2	<2	<2	<5	<2
0048	90*	<1	<1	<1	<1	<2	<2	22	22	<2
0049	20	<1	<1	<1	<1	<2	<2	<2	37	<2
0050	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
0051	<20	<1	<1	<1	<1	<2	<2	2	<5	<2
St. Lawrence River										
0356	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
0357	40	<1	1	<1	<1	<2	<2	5	<5	<2
0358	<20	<1	<1	<1	<1	<2	<2	<2	<5	<2
0359	55*	<1	<1	<1	<1	<2	<2	<2	<5	<2
0360	25	<1	<1	<1	<1	<2	<2	<2	<5	<2

< Lower than detection limit

\- No data

* Equals or exceeds MOE Guidelines (PCBs 50 ng/g)

Table 2.2 (Cont'd.) - Pesticides Analysis of Sediment (Units based on dry weight, ng/g)

Station	Endo-sulfan II	Endrin	Endosulfan sulphate	Heptachlor epoxide	Heptachlor	Mirex	Oxychlor-dane	OP-DDT	PP-DDD	PP-DDE	PP-DDT	Hexachloro-benzene
Niagara River												
0113	4	4	4	1	<2	5	<2	5	5	1	5	1
0126	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	14
0127	4	4	4	1	<2	5	2	5	5	1	5	1
0148	4	6	4	1	<2	5	2	5	5	1	5	1
0156	<4	110	<4	<1	2	670	<2	<5	<5	8	<5	7
0157	<4	<4	<4	<1	5	400	<2	<5	10	9	10	13
0160	<4	<4	<4	<1	<2	285	<2	<5	<5	3	5	11
0183	<4	324	<4	<1	<2	<5	<2	<5	<5	10	<5	2
0184	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	5
St. Marys River												
0044	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	<1
0045	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	<1
0046	<4	5	<4	<1	<2	<5	<2	<5	<5	<1	<5	<1
0047	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	<1
0048	<4	70	<4	<1	<2	<5	<2	<5	22	<1	<5	<1
0049	<4	45	20	<1	<2	<5	<2	<5	37	<1	<5	<1
0050	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	<1
0051	<4	<4	<4	<1	<2	<5	<2	<5	<5	<1	<5	<1
St. Lawrence River												
0356	<4	<4	<1	<1	<2	<5	<2	<5	<5	<1	<5	<1
0357	<4	<4	<1	<1	<2	<5	<2	<5	<5	<1	<5	<1
0358	<4	<4	<1	<1	<2	<5	<2	<5	<5	<1	<5	<1
0359	<4	<4	<1	<1	<2	<5	<2	<5	<5	<1	<5	<3
0360	<4	<4	<1	<1	<2	<5	<2	<5	<5	<1	<5	<8

< Lower than detection limit

2.3 Sediment Grain Size

Sediment grain size distribution was determined using both the sieve and hydrometer methods. Using the sieve method, samples are dispersed in a distilled water and Calgon solution and the sand fraction is separated from the silt and clay particles by wet sieving through a No. 10 Tyler sieve. The silt and clay suspension passing through the sieve is retained and then analyzed by Hydrometer analysis. Particles remaining on the sieve are dried and then passed through a nest of sieves by means of a mechanical shaker. The size fractions are weighed and expressed as a percentage of the original sample weight.

The remaining silt and clay particles are dispersed in water in a blender and transferred to a sedimentation cylinder. The changes in the density of the suspension are measured at pre-set times using a calibrated standard hydrometer. Density measurements at these times are used to determine the concentration of particles remaining in suspension.

Table 2.3 - % Sediment Grain Size

Station	Gravel >1000um	Coarse Sand 999-500um	Medium Sand 500-250um	Fine Sand 250-125um	Sand 125-62um	Coarse Silt 62-29.85um	Silt 29.85-2.63um	Clay <2.63um
Windermere Basin								
2086	0.62	0	0	2.44	6.10	2.55	48.56	39.73
2087	-	-	-	-	-	-	-	-
2088	0	0	0	3.03	2.00	10.70	70.38	13.89
2089	0	0	0	0	0	22.32	68.83	8.85
2090	0	0	0	2.66	2.16	13.51	62.19	19.49
Outside Hamilton Harbour								
2096	0	0	0	2.40	17.99	28.60	39.61	11.40
2097	0	0	6.57	27.11	41.08	7.93	12.49	4.82
2098	0	0	0	3.05	26.58	34.26	29.90	6.21
2099	0.12	0	0	0.99	11.67	42.18	41.29	3.75
2100	0	0	0	0	8.67	24.76	56.20	10.37
Humber Bay								
2113	0.43	0	2.45	10.17	14.37	15.16	45.81	11.61
2115	0	0	0	1.70	4.49	10.06	65.54	18.21
2118	0	0	0	0.72	5.72	15.08	59.00	19.38
2330	2.32	0.41	9.00	7.78	18.00	5.73	41.43	15.33
2331	0	0	0	0	6.03	3.85	66.69	23.43
2334	0	0.10	0	2.04	14.06	12.75	54.06	16.99
2335	0	0	0	0	7.90	4.84	69.81	17.45
2336	0	0	0	2.22	10.88	10.24	59.09	17.57
2337	0	0	0	2.58	12.64	8.20	58.20	18.38
2339	0.68	0	34.88	39.14	11.06	0	10.96	3.28
2340	-	-	-	-	-	-	-	-
2367	1.40	0	19.49	32.78	35.44	0.89	7.00	3.00
2368	0	0	0	2.82	8.17	12.37	62.16	14.48
2369	0	0	0.68	9.81	19.97	4.70	48.96	15.88
2370	0	0	0	1.12	8.28	10.74	59.69	20.17
2371	0.01	0	0	1.47	10.07	6.77	53.09	28.59
Toronto Harbour								
1346 S	0.70	0	3.66	7.72	19.93	15.80	40.46	11.73
1352 IH	0	0	0	0.75	2.34	0.87	46.10	49.94
1354 S	0	0	0	0	8.81	3.43	47.40	40.37
1357 IH	0	0	0	0.45	2.90	0.78	48.89	46.98
1362 S	0	0	0	1.13	2.11	0	52.25	44.51
1365 IH	0	0	0	0.59	1.17	0.36	48.93	48.94

- No Data

(S = boat slips, IH = inner Toronto Harbour)

Table 2.3 - (Cont'd.) - % Sediment Grain Size

Station	Gravel >1000um	Coarse Sand 999-500um	Medium Sand 500-250um	Fine Sand 250-125um	Sand 125-62um	Coarse Silt 62-29.85um	Silt 29.85-2.63um	Clay <2.63um
Toronto Harbour								
1366 IH	0.04	0	0	0.38	0.52	0.83	46.17	52.06
1371 IH	0	0	0	0.30	5.19	0.48	57.36	36.67
1375 S	0	0	0.67	2.88	11.98	6.66	58.35	19.45
1379 S	0	0	0	0	9.10	11.16	55.13	24.60
Eastern Headland								
2108	0.17	0	26.99	40.09	10.63	5.71	12.98	3.43
2277	0.21	0	2.27	3.68	18.71	3.69	37.86	33.58
2280	0.08	0	1.57	2.99	6.46	6.40	53.04	29.46
2284	0	0	4.11	8.62	22.59	10.46	38.90	15.32
2373	0	0	1.56	0.84	9.22	6.84	64.37	17.16
Ashbridges Bay								
2034	0	0	2.58	6.44	16.43	12.86	49.49	12.20
2036	0.06	0	34.23	48.49	12.36	0	1.85	3.01
East Side of the Headland								
2038	0	0	2.42	15.29	40.26	22.54	7.41	12.08
2101	4.55	2.74	40.17	32.87	15.52	0.50	2.82	0.83
2102	2.00	0	29.10	42.39	11.64	0.58	2.88	1.42
2103	0.18	0	26.47	48.20	19.85	0	3.39	1.92
Scarborough Bluffs								
2081	0.37	0	1.96	36.17	52.81	6.84	1.04	0.81
2082	0	0	0	2.59	23.70	31.60	34.71	7.40
2085	21.55	2.25	25.44	17.47	25.95	3.74	2.27	1.33
Bluffers Park								
2083	0	0	2.03	4.67	10.35	3.25	43.84	35.87
2084	0	0	9.10	20.58	14.35	4.87	34.94	16.17
Frenchman Bay								
2091	0	0	0.95	3.79	7.77	14.54	58.36	14.59
2092	0	0	0.41	0.74	2.03	1.43	52.46	42.93
2093	0	0	10.31	30.93	32.52	8.03	13.45	4.76
2094	0	0	0.35	3.49	6.63	13.58	59.44	16.51
2095	0	0	0.38	2.20	3.73	5.06	56.07	32.56

(S = boat slips, IH = inner Toronto Harbour)

Table 2.3 - (Cont'd.) - % Sediment Grain Size

Station	Gravel >1000um	Coarse Sand 999-500um	Medium Sand 500-250um	Fine Sand 250-125um	Sand 125-62um	Coarse Silt 62-29.85um	Silt 29.85-2.63um	Clay <2.63um
St. Clair River								
0017	1.81	0	7.53	27.12	33.15	7.53	15.32	7.54
0034	0	0	4.21	31.18	41.29	9.00	11.80	2.52
0064	0.21	0	1.96	14.99	35.19	17.54	23.53	6.58
0065	0.09	0	2.04	17.64	37.99	14.34	23.09	4.81
0066	0	0	4.57	28.96	36.58	6.10	11.18	12.61
0067	27.44	3.47	34.67	20.81	10.40	0.29	2.09	0.83
0068	0	0	1.60	20.76	42.33	15.18	12.28	7.85
0069	6.05	0	14.33	32.02	33.72	5.47	6.77	1.64
Niagara River								
0113	0	0	0.90	0.54	2.04	2.52	76.14	17.86
0126	1.11	0	12.70	38.09	22.86	11.85	10.26	3.13
0127	2.85	0	25.51	47.17	11.57	4.69	6.69	1.22
0148	0.38	0	2.85	13.68	29.64	15.09	34.54	3.84
0156	0	0	1.55	8.24	27.33	24.60	32.47	5.81
0157	0	0	0	20.19	39.84	14.52	20.39	4.96
0160	0	0	5.52	46.96	32.22	7.37	5.00	2.93
0183	0	0	3.19	29.48	34.26	12.75	7.72	12.60
0184	-	-	-	-	-	-	-	-
St. Marys River								
0044	0	0	2.40	12.00	27.61	27.60	27.19	3.20
0045	0	0	0	6.12	25.50	26.73	35.28	6.37
0046	0	0	0	0	4.14	8.69	74.05	13.12
0047	0	0	0	3.87	18.32	20.80	47.94	9.07
0048	0.08	0	0.40	3.02	7.64	21.02	63.05	4.79
0049	0.29	0	18.04	32.16	26.67	1.57	5.10	16.17
0050	1.05	7.27	29.99	29.09	24.54	1.21	5.48	1.37
0051	0.25	0	23.49	38.84	28.00	1.32	6.78	1.32
St. Lawrence River								
0356	0	0	1.03	3.10	8.78	29.24	51.92	5.93
0357	0	0	4.10	14.64	29.87	15.35	29.83	6.21
0358	0	0	1.00	2.15	6.73	4.49	63.40	22.28
0359	0	0	9.73	22.32	16.02	9.16	25.66	17.11
0360								

- No Data

2.4 Metal Distribution Among the Geochemical Phases of Sediment

The < 63 um fraction of sediment includes very fine sand, silt and clay, which is the size range of sediment that is normally ingested by benthic macroinvertebrates and often has a higher affinity for metals than larger particles (Krantzberg and Bailey, 1983). This fraction was subjected to a sequential chemical leaching procedure to determine the geochemical partitioning of the metals. The sequential extraction procedure was applied to seven metals: copper, zinc, lead, cadmium, iron, manganese and arsenic (Tables 2.4.1 - 2.4.7). The extraction procedure for arsenic was only appied at 40 of the 87 stations. The geochemical phases (operationally defined) identified in the procedure were:

IW	- interstitial (pore) water
F1	- cation exchangeable/weakly adsorbed metal ion
F2	- specifically adsorbed and easily reducible metals
F3	- organic/sulphide bound metals
F4	- moderately reducible (Fe/Mn oxides) metals
Residual	- residual metal
IW-F4	- potentially available metal
Sum	- sum of the geochemical phases
Total	- total metal

This procedure has been developed for the In-Place Pollutants Program and is based on information published in the literature (Forstner and Wittman, 1981; Jackson et al., 1978; Tessier et al; 1979; Brannon et al., 1976; Gupta and Chen, 1975).

The first step identifies the soluble metals present in the interstitial (pore) water (IW). This fraction is considered to be readily available to the aquatic biota (Forstner and Wittman, 1981).

The second step identifies the weakly adsorbed fraction of metals. This fraction is associated with sediments mainly

through physical adsorption. The metals (which are positively charged) attach (non-specifically) to negatively charged surfaces of particles such as clays and organic matter. The metals in this phase (F1) are in equilibrium with the water soluble phase (IW).

Step three examines the specifically adsorbed (chemical adsorption) and easily reducible fraction (F2). The specifically adsorbed metals differ from those in phase F1 in that the association is stronger than electrostatic adsorption. The metals form weak bonds with the solids. Theoretically, the chemical extractants used in this step also dissolve the manganese oxides while having little effect on the iron oxides. Release in the natural environment can be triggered under reducing (anaerobic) conditions.

The fourth step is designed to release the metals associated with organic complexes and sulphide compounds (F3). In the natural environment metals from sulphides can be released under oxidizing conditions (change in redox potential). Organic matter can be degraded under oxidizing conditions, releasing metals (Jackson et al., 1978).

The fifth step identifies in part, the metals sorbed to iron and manganese oxides (F4). These oxides can exist as nodules, concretions or coatings on particulates. They are good scavengers of metals but are unstable under anaerobic conditions (low Eh) (Jackson et al., 1978).

The sixth step identifies the residual phase. The metals in this phase are bound within the crystal lattice of minerals and are normally unavailable to biota.

The additional categories listed in the tables are as follows. IW-F4 is the sum of the first 5 phases and represents the potentially available metal. Sum is the sum of the six

TABLE 2.4.1: Distribution of Copper Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	1W	F1	F2	F3	F4	Residual	1W-F4	Sum	Total
Windermere Basin	2086	0.082	3.22	< 0.10	64.61	4.58	38.10	72.49	110.59	103.12
	2087	0.020	4.93	< 0.10	73.84	6.18	11.61	84.97	96.58	94.68
	2088	0.025	8.63	< 0.10	145.92	21.79	4.80	176.37	181.17	189.39
	2089	0.062	15.14	< 0.10	165.70	91.33	23.11	272.23	295.34	294.33
	2090	0.062	10.48	< 0.10	206.05	33.06	12.72	249.65	262.37	289.49
Outside Hamilton Harbour	2096	0.020	4.67	< 0.10	42.57	4.38	0.71	51.64	52.35	58.43
	2097	0.021	5.32	< 0.10	15.50	2.88	0.20	23.72	23.92	25.50
	2098	0.020	3.49	< 0.10	10.43	2.11	7.92	16.05	23.97	20.33
	2099	0.020	2.24	< 0.10	8.26	2.17	11.25	12.69	23.94	24.68
	2100	0.020	4.81	< 0.10	27.61	3.07	1.11	35.51	36.62	33.49
Humber Bay	2113	0.025	< 0.10	< 0.10	154.01	7.33	23.47	161.56	185.03	149.04
	2115	< 0.010	< 0.10	0.28	399.74	27.50	37.00	427.63	464.62	345.87
	2118	< 0.010	< 0.10	< 0.10	150.17	11.10	20.20	161.48	181.68	92.00
	2330	0.082	6.18	< 0.10	17.33	4.61	74.51	28.20	102.71	100.73
	2331	0.082	8.06	< 0.10	97.42	8.22	0.80	113.78	114.58	110.90
	2334	0.020	3.87	< 0.10	23.63	18.58	15.80	46.10	61.90	66.09
	2335	0.185	4.70	< 0.10	45.75	3.65	5.10	54.29	59.39	56.39
	2336	0.020	2.17	< 0.10	28.43	1.38	15.42	32.00	47.42	49.02
	2337	0.023	< 0.10	< 0.10	31.58	1.49	14.31	33.10	47.51	45.92
	2339	0.020	< 0.10	< 0.10	32.00	2.40	5.10	34.42	39.52	43.22
	2340	0.020	3.35	< 0.10	41.42	2.52	8.00	47.31	55.31	55.08
	2367	0.020	20.19	< 0.10	57.46	72.80	19.74	150.47	170.21	160.87
	2368	0.126	7.22	< 0.10	101.20	11.22	54.15	119.77	173.92	166.49
	2369	0.062	5.80	< 0.10	55.51	6.23	31.59	67.60	99.19	96.81
	2370	0.169	< 0.10	0.24	318.36	13.44	22.52	332.31	354.82	237.26
	2371	< 0.010	< 0.10	< 0.10	121.33	7.93	19.51	129.47	148.98	62.65
Toronto Harbour	1346	0.103	< 0.10	< 0.10	54.73	5.27	27.52	60.11	87.63	90.22
	1352	0.022	4.10	< 0.10	69.40	3.31	1.43	76.83	78.26	82.32
	1354	0.020	< 0.10	< 0.10	29.78	4.27	56.80	34.07	90.87	92.23
	1357	0.082	3.84	< 0.10	62.83	4.62	11.60	71.37	82.97	80.10
	1362	0.042	< 0.10	< 0.10	42.88	2.51	27.90	45.44	73.34	73.97
	1365	0.020	5.20	< 0.10	54.06	4.08	7.71	63.36	71.07	76.88
	1366	0.020	6.38	< 0.10	63.43	3.62	1.62	73.45	75.07	72.82
	1371	0.041	2.43	< 0.10	44.64	2.56	9.60	49.67	59.27	57.24
	1375	0.043	1.95	< 0.10	16.84	1.00	27.60	19.84	47.44	50.92
	1379	0.041	2.41	< 0.10	27.43	1.21	16.34	31.09	47.43	53.17
East Headland	2108	< 0.010	0.25	0.25	41.71	5.88	15.48	48.11	63.59	52.46
	2277	< 0.010	0.20	7.21	73.11	7.11	19.46	87.65	107.11	92.87
	2280	0.016	0.24	0.16	52.56	3.69	15.14	56.66	71.80	40.01
	2284	0.047	0.23	0.23	97.94	10.14	25.07	108.60	133.67	124.76
	2373	< 0.010	0.17	0.17	50.22	3.26	15.15	53.83	68.98	43.54
Ashbridges Bay	2034	0.041	1.41	< 0.10	65.40	6.06	96.92	72.91	169.83	174.25
	2036	0.041	9.73	< 0.10	109.80	32.28	25.88	177.73	177.73	172.93

< Lower than detection limit

TABLE 2.4.1 (Cont'd): Distribution of Copper Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	1W	F1	F2	F3	F4	Residual	1W-F4	Sum	Total
Toronto Eastern	2038	0.041	0.66	< 0.10	9.98	2.11	14.89	12.79	27.68	26.23
Waterfront	2081	< 0.010	0.99	< 0.10	7.75	0.78	2.30	9.52	11.82	10.27
	2082	0.020	2.64	< 0.10	10.32	0.42	24.60	13.40	38.00	38.03
	2083	0.041	1.66	< 0.10	14.64	0.53	10.80	16.87	27.67	25.25
	2084	< 0.010	3.07	< 0.10	11.53	0.31	4.80	14.91	19.71	22.19
	2085	< 0.010	9.29	< 0.10	15.65	1.64	1.00	26.58	27.58	25.24
	2101	0.062	5.27	< 0.10	8.28	1.02	5.17	14.63	19.80	22.25
	2102	0.020	5.47	< 0.10	4.93	0.70	9.56	11.12	20.68	17.93
	2103	0.040	3.32	< 0.10	11.49	2.07	2.86	16.92	19.78	18.02
Frenchman Bay	2091	< 0.010	6.12	< 0.10	40.02	1.66	1.60	47.80	49.40	53.25
	2092	0.020	13.93	< 0.10	36.28	36.55	9.87	86.78	96.65	102.31
	2093	0.020	17.37	< 0.10	51.72	2.08	9.87	71.19	81.06	80.91
	2094	< 0.010	5.86	< 0.10	17.76	1.07	4.00	24.69	28.69	26.05
	2095	< 0.010	6.13	< 0.10	18.84	1.02	5.60	25.99	25.99	30.24
St. Clair River	0017	< 0.010	0.26	< 0.10	25.10	1.67	7.21	27.14	34.34	26.38
	0034	< 0.010	0.36	< 0.10	20.97	0.87	6.22	22.31	28.52	26.75
	0064	< 0.010	0.46	0.15	20.67	0.84	5.91	22.13	28.04	23.73
	0065	< 0.010	0.33	< 0.10	23.56	1.14	7.48	25.14	32.61	25.19
	0066	< 0.010	0.55	< 0.10	20.15	1.47	5.40	22.28	27.68	21.98
	0067	< 0.010	0.53	< 0.10	10.52	0.66	2.37	11.81	14.18	-
	0068	< 0.010	0.39	< 0.10	25.12	1.65	5.34	27.27	32.61	23.55
	0069	< 0.010	0.28	< 0.10	61.06	1.21	7.60	62.66	70.26	73.13
Niagara River	0113	< 0.010	< 0.10	0.19	94.96	4.17	19.28	99.43	118.72	96.9
	0126	< 0.010	< 0.10	0.16	22.00	0.47	5.91	22.74	28.65	22.87
	0127	< 0.010	0.15	0.15	174.72	8.23	19.58	183.25	202.83	155.79
	0148	< 0.010	< 0.10	0.24	16.78	0.72	7.72	17.85	25.58	21.12
	0156	< 0.010	< 0.10	0.19	79.46	3.10	12.21	82.86	95.07	74.61
	0157	< 0.010	< 0.10	0.23	73.65	3.97	18.24	77.95	96.19	83.84
	0160	< 0.010	< 0.10	0.15	17.74	0.61	5.41	18.61	24.02	45.69
	0183	< 0.010	< 0.10	< 0.10	125.77	5.78	20.66	131.76	152.41	86.29
	0184	< 0.010	< 0.10	0.17	46.06	1.65	9.39	47.99	57.38	38.83
St. Marys River	0044	< 0.010	0.26	< 0.10	22.90	2.76	10.93	26.03	36.96	23.76
	0045	< 0.010	0.25	< 0.10	18.99	3.75	9.87	23.10	32.97	23.12
	0046	< 0.010	0.46	0.70	155.74	10.00	39.75	166.91	206.66	197.58
	0047	< 0.010	0.67	< 0.10	83.13	5.49	19.45	89.39	108.84	94.76
	0048	< 0.010	0.40	< 0.10	160.32	7.21	53.91	168.05	221.95	218.44
	0049	< 0.010	< 0.10	< 0.10	29.07	5.90	10.32	35.18	45.50	49.96
	0050	< 0.010	< 0.10	< 0.10	8.45	1.61	5.73	10.27	16.00	14.53
	0051	< 0.010	0.15	< 0.10	9.74	1.89	6.54	11.88	18.42	15.98
St. Lawrence River	0356	< 0.010	< 0.10	< 0.10	11.02	1.59	3.67	12.82	16.50	12.54
	0357	< 0.010	< 0.10	< 0.10	17.69	2.53	7.33	20.43	27.75	20.09
	0358	< 0.010	< 0.10	< 0.10	27.80	2.79	9.23	30.80	40.03	28.65
	0359	< 0.010	< 0.10	< 0.10	28.32	3.35	8.90	31.88	40.79	30.06
	0360	< 0.010	< 0.10	< 0.10	37.46	3.97	12.26	41.64	53.90	46.08

< Lower than detection limit

- No data

TABLE 2.4.2: Distribution of Cadmium Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Windermere Basin	2086	0.010	0.18	0.42	3.81	0.52	2.70	4.94	7.64	6.80
	2087	0.012	0.25	0.43	3.45	0.65	1.60	4.79	6.39	7.03
	2088	0.010	0.48	0.56	5.07	1.48	2.01	7.60	9.61	8.95
	2089	0.010	0.93	0.89	9.35	3.70	4.30	14.88	19.18	18.45
	2090	0.010	0.61	1.54	9.34	2.45	1.50	13.95	15.45	16.33
Outside Hamilton Harbour	2096	0.010	0.29	0.74	1.84	0.55	1.40	3.43	4.83	4.06
	2097	0.007	0.36	0.79	1.19	0.38	1.12	2.73	3.85	4.05
	2098	0.011	0.18	0.59	1.12	0.24	1.70	2.14	3.84	3.68
	2099	0.007	0.10	0.39	1.05	0.20	1.20	1.75	2.95	3.42
	2100	< 0.005	0.25	0.73	1.55	0.50	1.81	3.03	4.84	4.22
Humber Bay	2113	< 0.005	< 0.05	< 0.05	6.64	< 0.05	< 0.05	6.64	6.64	2.79
	2115	< 0.005	< 0.05	< 0.05	54.57	2.34	< 0.05	56.91	56.91	21.33
	2118	< 0.005	< 0.05	< 0.05	11.90	0.53	< 0.05	12.43	12.43	3.28
	2330	0.017	0.21	0.71	8.84	1.67	2.00	11.45	13.45	12.92
	2331	0.010	0.27	0.71	10.03	2.25	0.13	13.27	13.40	14.02
	2334	0.010	0.12	0.38	2.86	0.48	1.90	3.85	5.75	6.50
	2335	0.017	0.17	0.36	6.23	1.29	1.50	8.07	9.57	10.02
	2336	0.006	0.13	0.24	2.03	0.31	3.10	2.72	5.82	6.33
	2337	0.007	0.22	0.43	2.11	0.36	1.79	3.13	4.92	5.56
	2339	< 0.005	0.26	0.59	2.88	0.73	0.32	4.46	4.78	5.33
	2340	0.010	0.22	0.44	3.75	0.82	0.62	5.24	5.86	5.57
	2367	0.007	0.74	1.97	3.46	1.36	3.20	7.54	10.74	10.05
	2368	0.087	0.24	0.64	13.06	1.38	9.20	15.41	24.61	24.05
	2369	0.016	0.21	0.61	6.48	1.89	4.80	9.21	14.01	15.17
	2370	< 0.005	< 0.05	< 0.05	46.00	0.91	< 0.05	46.91	46.91	14.28
	2371	< 0.005	< 0.05	< 0.05	10.39	0.40	< 0.05	10.78	10.78	1.82
Toronto Harbour	1346	0.030	0.12	0.37	7.25	1.40	2.20	9.17	11.37	12.28
	1352	0.017	0.34	0.36	7.04	1.39	0.50	9.15	9.65	9.04
	1354	0.012	0.23	0.56	3.80	1.13	3.61	5.73	9.34	10.02
	1357	0.014	0.26	0.60	7.12	1.42	0.20	9.41	9.61	8.92
	1362	0.010	0.21	0.42	4.28	0.49	1.20	5.41	6.61	7.20
	1365	0.010	0.34	0.46	5.76	1.45	0.20	8.02	8.22	8.96
	1366	0.014	0.33	0.48	6.07	1.28	1.43	8.17	9.60	10.66
	1371	0.008	0.17	0.37	4.55	0.59	3.61	5.69	9.30	9.67
	1375	0.010	0.75	0.15	1.81	0.21	3.02	2.93	5.95	5.11
	1379	0.007	0.11	0.19	0.78	0.13	4.70	1.22	5.92	6.41
East Headland	2108	< 0.005	< 0.05	< 0.05	1.93	< 0.05	< 0.05	1.93	1.93	0.66
	2277	0.010	< 0.05	< 0.05	4.35	0.20	< 0.05	4.55	4.55	2.37
	2280	0.016	< 0.05	< 0.05	2.43	< 0.05	< 0.05	2.45	2.45	0.67
	2284	0.047	< 0.05	< 0.05	5.89	0.70	< 0.05	6.63	6.63	2.97
	2373	< 0.005	< 0.05	< 0.05	1.09	< 0.05	< 0.05	1.09	1.09	0.29
Ashbridges Bay	2034	0.007	0.06	0.14	3.22	0.46	3.83	3.89	7.72	7.20
	2036	0.008	0.44	0.75	4.71	0.32	0.70	6.23	6.93	7.22

< Lower than detection limit

TABLE 2.4.2 (Cont'd): Distribution of Cadmium Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Toronto Eastern	2038	0.007	0.05	0.12	0.77	0.07	2.80	1.02	3.82	4.09
Waterfront	2081	0.006	0.38	0.87	1.02	0.21	1.34	2.49	3.83	4.12
	2082	0.010	0.18	0.27	1.31	0.19	1.81	1.96	3.77	3.66
	2083	0.007	0.18	0.36	1.71	0.20	1.33	2.46	3.79	3.42
	2084	0.014	0.14	0.34	1.84	0.18	1.81	2.51	4.32	4.19
	2085	0.010	0.50	0.93	2.35	0.38	1.60	4.17	5.77	5.29
	2101	0.009	0.20	0.42	1.36	0.08	2.71	2.07	4.78	5.12
	2102	0.003	0.23	0.36	1.34	0.12	2.80	2.05	4.85	4.43
	2103	0.003	0.14	0.20	2.04	0.18	3.32	2.56	5.88	5.28
Frenchman Bay	2091	< 0.005	0.32	1.08	2.72	0.73	0.90	4.85	5.75	6.26
	2092	0.010	0.50	1.54	1.77	0.59	2.40	4.41	6.81	7.18
	2093	0.007	0.62	1.91	8.27	0.70	4.81	11.51	16.32	14.88
	2094	0.006	0.30	1.03	3.48	0.62	0.41	5.44	5.85	5.35
	2095	< 0.005	0.35	0.81	2.96	0.73	1.00	4.85	5.85	6.03
St. Clair River	0017	< 0.005	< 0.05	< 0.05	0.26	< 0.05	0.16	0.26	0.42	0.32
	0034	< 0.005	< 0.05	0.07	0.33	< 0.05	0.14	0.40	0.54	0.18
	0064	< 0.005	< 0.05	< 0.05	0.38	< 0.05	< 0.05	0.38	0.38	1.15
	0065	< 0.005	< 0.05	< 0.05	0.45	< 0.05	0.20	0.45	0.65	0.49
	0066	< 0.005	< 0.05	< 0.05	0.60	< 0.05	0.09	0.60	0.69	1.33
	0067	< 0.005	< 0.05	0.07	0.20	< 0.05	< 0.05	0.26	0.26	-
	0068	< 0.005	< 0.05	< 0.05	0.79	0.08	0.08	0.86	0.94	0.55
	0069	< 0.005	< 0.05	< 0.05	2.13	0.07	0.11	2.20	2.31	2.88
Niagara River	0113	< 0.005	< 0.01	< 0.01	4.07	0.10	< 0.05	4.17	4.17	2.91
	0126	< 0.005	< 0.01	< 0.01	0.99	0.08	< 0.05	1.06	1.06	0.83
	0127	< 0.005	< 0.01	< 0.01	8.12	0.22	< 0.05	8.34	8.34	6.04
	0148	< 0.005	< 0.01	< 0.01	0.66	< 0.05	< 0.05	0.66	0.66	0.57
	0156	< 0.005	< 0.01	< 0.01	3.88	0.10	< 0.05	3.97	3.97	2.71
	0157	< 0.005	< 0.01	< 0.01	3.85	0.11	< 0.05	3.97	3.97	3.06
	0160	< 0.005	< 0.01	< 0.01	0.76	< 0.05	< 0.05	0.76	0.76	1.79
	0183	< 0.005	< 0.01	< 0.01	5.23	0.09	< 0.05	5.32	5.32	2.34
	0184	< 0.005	< 0.01	< 0.01	1.69	< 0.05	< 0.05	1.69	1.69	0.96
St. Marys River	0044	< 0.005	< 0.01	< 0.01	0.60	< 0.05	< 0.05	0.60	0.60	0.26
	0045	< 0.005	< 0.01	< 0.01	0.69	0.19	< 0.05	0.87	0.87	0.50
	0046	< 0.005	< 0.01	< 0.01	3.02	< 0.05	< 0.05	3.02	3.02	2.44
	0047	< 0.005	< 0.01	< 0.01	1.66	< 0.05	< 0.05	1.66	1.66	1.50
	0048	< 0.005	< 0.01	< 0.01	4.11	< 0.05	< 0.05	4.11	4.11	4.21
	0049	< 0.005	< 0.01	< 0.01	0.66	< 0.05	< 0.05	0.66	0.66	0.86
	0050	< 0.005	< 0.01	< 0.01	0.42	< 0.05	< 0.05	0.42	0.42	0.42
	0051	< 0.005	< 0.01	< 0.01	0.44	< 0.05	< 0.05	0.44	0.44	0.51
St. Lawrence River	0356	< 0.005	< 0.01	< 0.01	0.55	< 0.05	< 0.05	0.55	0.55	0.45
	0357	< 0.005	< 0.01	< 0.01	1.14	< 0.05	< 0.05	1.14	1.14	1.01
	0358	< 0.005	< 0.01	< 0.01	1.21	< 0.05	< 0.05	1.21	1.21	0.91
	0359	< 0.005	< 0.01	< 0.01	0.35	< 0.05	< 0.05	0.35	0.35	0.52
	0360	< 0.005	< 0.01	< 0.01	1.59	< 0.05	0.34	1.59	1.93	1.76

< Lower than detection limit

- No data

TABLE 2.4.3: Distribution of Zinc Among Geochemical Forms
(ug/g Dry Weight)

Location	Station		IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Windermere Basin	2086		0.904	3.66	5.80	678.40	21.77	94.00	710.53	804.53	825.7
	2087		0.362	3.90	7.58	580.10	35.82	36.20	627.76	663.96	625.0
	2088		0.525	9.51	22.86	1003.90	158.90	53.60	1195.70	1249.29	1220.9
	2089		0.597	26.67	65.35	1238.00	885.81	200.30	2216.43	2416.73	2490.8
	2090		0.561	13.70	37.90	1544.00	360.50	26.80	1956.66	1983.46	2003.5
Outside Hamilton Harbour	2096		0.127	3.07	6.38	156.10	8.42	36.40	174.10	210.50	190.7
	2097		0.004	2.16	8.63	47.00	2.16	9.20	59.95	69.15	65.7
	2098		0.008	1.21	4.85	29.20	2.42	31.50	37.69	69.19	72.3
	2099		0.004	0.91	4.54	17.20	1.81	27.40	24.46	51.86	47.7
	2100		0.003	1.95	7.80	71.50	3.89	1.50	85.14	86.64	90.4
Humber Bay	2113		0.037	2.04	6.97	755.81	106.74	319.60	871.60	1191.20	380.1
	2115		0.028	6.83	9.65	4420.90	488.71	409.94	4926.11	5336.05	1309.8
	2118	<	0.005	2.37	4.16	782.84	145.38	238.43	934.76	1173.19	270.7
	2330		0.072	3.32	6.24	544.60	12.26	0.10	566.49	566.59	540.9
	2331		0.126	5.84	8.63	522.10	41.75	84.10	578.45	662.55	690.3
	2334	<	0.005	1.26	3.37	137.40	3.20	101.30	145.23	246.53	210.9
	2335		0.072	3.00	5.74	308.60	16.66	13.50	334.07	347.57	330.1
	2336		0.127	1.34	2.68	132.90	1.99	27.60	139.04	166.64	145.2
	2337		0.072	1.95	3.58	100.70	1.17	59.10	107.47	166.57	187.7
	2339		0.054	5.75	11.26	157.50	6.90	18.40	181.46	199.86	220.0
	2340		0.164	4.19	8.26	178.60	5.03	31.90	196.24	228.14	253.8
	2367		0.043	8.46	59.28	256.10	27.10	99.50	350.98	450.48	409.8
	2368		0.246	7.15	8.95	723.90	49.51	274.70	789.76	1064.46	1130.5
	2369	<	0.005	3.74	7.78	459.10	26.23	148.40	496.85	645.25	658.8
	2370		0.303	7.62	7.62	3076.80	187.54	231.49	3279.88	3511.37	861.9
	2371		0.040	2.14	3.47	711.88	125.77	172.31	843.30	1015.61	227.6
Toronto Harbour	1346		0.145	2.42	11.92	435.80	21.18	49.90	471.47	521.37	567.3
	1352		0.145	4.51	10.29	411.90	10.79	27.60	437.64	465.24	477.0
	1354		0.125	1.28	11.84	429.10	40.12	9.90	482.47	492.37	597.3
	1357		0.125	1.92	10.25	373.10	15.95	22.30	401.35	423.65	538.2
	1362		0.127	1.18	6.36	354.10	5.74	88.70	367.51	456.21	425.0
	1365		0.271	4.00	9.49	308.20	8.41	82.50	330.37	412.87	411.0
	1366		0.217	4.91	10.57	408.10	8.08	2.80	431.88	434.68	478.0
	1371		0.070	1.17	6.50	344.20	6.37	10.90	358.31	369.21	397.3
	1375		0.072	1.14	4.72	103.70	2.73	159.20	112.36	271.56	258.3
	1379		0.036	1.73	3.84	240.90	3.15	32.70	249.66	282.36	267.9
East Headland	2108		0.006	0.77	1.49	95.88	27.96	87.57	126.10	213.67	126.4
	2277	<	0.005	0.98	42.94	380.60	85.10	190.50	509.62	700.12	283.6
	2280	<	0.005	1.30	3.77	184.62	35.69	104.62	225.39	330.00	92.6
	2284		0.035	4.62	8.86	611.82	151.19	262.68	776.53	1039.21	349.8
	2373		0.008	1.06	1.40	126.10	34.47	145.71	163.04	308.75	108.0
Ashbridges Bay	2034		0.036	0.53	2.12	376.60	22.02	233.90	401.31	635.21	647.3
	2036		0.018	8.10	15.60	409.30	4.25	116.20	437.27	553.47	579.3

< Lower than detection limit

TABLE 2.4.3 (Cont'd): Distribution of Zinc Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Toronto Eastern	2038	0.024	0.30	0.73	42.60	1.14	35.20	44.79	79.99	83.9
Waterfront	2081	< 0.005	5.73	10.89	54.20	4.00	8.40	74.82	83.22	77.4
	2082	< 0.005	1.30	2.38	27.00	0.39	55.80	31.07	86.87	92.4
	2083	0.024	0.73	1.45	46.10	0.30	67.20	48.60	115.80	102.3
	2084	0.036	0.53	0.83	31.90	0.28	47.90	33.58	81.48	75.6
	2085	0.026	6.75	10.92	99.80	2.99	11.60	120.49	132.09	120.9
	2101	0.020	1.26	2.42	36.40	0.24	46.60	40.34	86.94	91.3
	2102	0.036	0.56	2.33	22.80	0.16	64.60	25.89	90.49	94.2
	2103	0.024	0.99	2.54	55.20	0.53	52.90	59.28	112.18	107.2
Frenchman Bay	2091	0.036	1.87	3.78	131.30	2.65	49.00	139.64	188.64	210.7
	2092	0.047	2.40	8.50	125.30	5.40	72.40	141.65	214.05	253.2
	2093	0.045	2.24	5.79	145.70	2.41	113.10	156.19	269.29	287.9
	2094	0.036	1.82	3.61	90.20	1.79	54.60	97.46	152.06	132.8
	2095	0.036	1.18	2.77	124.20	1.45	38.70	129.64	168.34	153.4
St. Clair River	0017	< 0.005	0.88	1.62	352.02	11.98	38.60	366.51	405.10	80.4
	0034	< 0.005	1.82	3.24	21.54	3.66	45.59	30.27	75.86	73.4
	0064	< 0.005	1.17	1.87	60.34	3.28	45.11	66.67	111.77	70.8
	0065	< 0.005	1.19	1.93	73.95	6.29	69.33	83.35	152.68	78.0
	0066	< 0.005	1.85	2.62	67.96	6.81	58.73	79.24	137.97	71.9
	0067	< 0.005	1.90	2.68	24.20	2.07	19.02	30.86	49.88	-
	0068	< 0.005	0.54	1.18	50.27	7.10	63.46	59.10	122.55	69.5
	0069	< 0.005	1.05	1.98	428.38	14.57	46.87	445.98	492.85	475.7
Niagara River	0113	< 0.005	1.88	32.68	338.09	34.11	247.56	406.76	654.32	362.4
	0126	< 0.005	0.62	1.94	87.06	5.60	55.10	95.22	150.32	97.5
	0127	< 0.005	3.35	25.22	784.28	51.93	168.20	864.79	1032.98	577.3
	0148	< 0.005	0.34	2.40	60.11	6.89	70.97	69.75	140.71	108.6
	0156	< 0.005	5.63	16.45	1014.27	67.62	239.48	1103.98	1343.46	466.1
	0157	< 0.005	3.75	16.68	110.37	91.12	536.47	221.94	758.40	708.1
	0160	< 0.005	1.58	4.17	176.23	9.74	83.25	191.72	274.97	356.4
	0183	< 0.005	4.04	15.27	1162.67	80.88	292.01	1262.86	1554.88	412.2
	0184	< 0.005	1.45	5.44	305.02	18.97	113.10	330.87	443.97	214.6
St. Marys River	0044	0.026	1.57	22.68	168.97	10.38	64.47	203.62	268.09	93.8
	0045	0.025	2.37	34.03	227.92	32.35	132.69	296.70	429.39	133.7
	0046	0.046	25.50	318.79	2917.78	132.92	578.15	3395.05	3973.20	885.6
	0047	0.033	14.37	182.39	1381.73	63.23	245.95	1641.75	1887.70	528.7
	0048	0.080	18.47	381.52	3293.15	103.61	602.40	3796.84	4399.24	1202.4
	0049	0.016	8.05	93.09	556.64	79.14	98.59	736.93	835.51	603.6
	0050	0.007	0.45	7.42	42.94	5.08	42.94	55.89	98.83	62.9
	0051	0.007	0.38	4.28	51.18	6.82	54.35	62.67	117.02	67.6
St. Lawrence River	0356	0.021	0.83	1.02	52.82	2.88	30.25	57.57	87.82	56.8
	0357	0.025	1.47	2.11	119.71	15.77	105.34	139.08	244.43	92.9
	0358	0.024	0.59	1.36	137.08	16.39	125.29	155.44	280.74	98.3
	0359	0.023	0.80	1.07	49.44	9.89	88.18	61.22	149.40	54.3
	0360	0.023	0.77	2.22	215.15	30.56	168.77	248.72	417.49	179.3

< Lower than detection limit
- No data

TABLE 2.4.4: Distribution of Lead Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	1W	F1	F2	F3	F4	Residual	1W-F4	Sum	Total
Windermere Basin	2086	0.044	1.30	6.67	171.60	3.90	59.00	183.51	242.51	206.6
	2087	0.060	2.00	7.98	143.00	3.99	35.30	157.03	192.33	184.5
	2088	0.045	3.50	10.49	280.70	7.00	44.50	301.74	346.24	309.8
	2089	0.077	6.14	12.28	456.00	12.28	119.20	486.78	605.98	578.8
	2090	0.047	4.64	9.27	337.20	9.27	168.20	360.43	528.63	540.9
Outside Hamilton Harbour	2096	0.008	1.90	9.46	64.60	3.78	6.90	79.75	86.65	92.4
	2097	0.004	2.16	8.63	47.00	2.16	9.20	59.95	69.15	65.7
	2098	0.008	1.21	4.85	29.20	2.42	31.50	37.69	69.19	72.3
	2099	0.004	0.91	4.54	17.20	1.81	27.40	24.46	51.86	47.7
	2100	0.003	1.95	7.80	71.50	3.89	1.50	85.14	86.64	90.4
Humber Bay	2113	< 0.050	< 0.50	< 0.50	278.21	9.32	4.97	288.57	293.54	177.6
	2115	< 0.050	< 0.50	< 0.50	296.26	13.47	7.09	310.77	317.86	248.1
	2118	< 0.050	< 0.50	< 0.50	234.77	9.52	3.70	245.33	249.03	102.6
	2330	0.030	5.33	8.19	191.40	1.36	3.10	206.31	209.41	196.5
	2331	0.012	5.77	8.43	208.20	1.71	18.20	224.12	242.32	220.9
	2334	0.025	2.15	4.50	80.60	0.81	34.60	88.09	122.69	125.9
	2335	0.021	2.14	5.63	164.40	2.72	3.20	174.91	178.11	149.3
	2336	0.008	1.36	6.79	76.50	3.38	15.80	88.04	103.84	105.5
	2337	0.010	1.00	5.00	86.40	2.00	9.40	94.41	103.81	93.3
	2339	0.008	1.82	9.11	88.70	3.64	5.50	103.28	108.78	100.7
	2340	0.012	3.38	6.80	192.50	2.72	4.90	205.41	210.31	223.7
	2367	0.035	17.72	10.12	228.80	2.45	28.80	259.13	287.93	310.8
	2368	0.020	4.55	7.55	150.10	< 0.50	28.20	162.23	190.43	200.8
	2369	0.026	2.79	6.51	229.80	2.31	17.30	241.44	258.74	290.9
	2370	< 0.050	< 0.50	< 0.50	238.47	5.45	1.82	244.97	246.78	166.4
	2371	< 0.050	< 0.50	< 0.50	239.49	9.12	4.76	249.66	254.41	98.3
Toronto Harbour	1346	0.080	5.64	6.47	442.90	5.20	145.50	460.29	605.79	589.5
	1352	0.040	3.50	9.98	307.90	3.33	21.40	324.75	346.15	365.4
	1354	0.041	4.45	6.07	270.80	2.62	79.50	283.98	363.48	325.6
	1357	0.062	6.48	8.91	401.30	3.20	26.20	419.95	446.15	480.9
	1362	0.040	4.31	5.48	158.80	1.58	141.30	170.21	311.51	360.9
	1365	0.042	5.21	10.41	285.00	6.25	4.60	306.91	311.51	342.1
	1366	0.065	5.21	8.69	206.90	5.21	102.80	226.08	328.88	337.6
	1371	0.035	4.34	5.93	144.30	1.65	120.70	156.26	276.96	303.4
	1375	0.025	1.72	2.33	115.10	0.65	70.50	119.82	190.33	184.4
	1379	0.035	2.58	2.98	101.90	0.80	99.40	108.30	207.70	196.9
East Headland	2108	< 0.050	0.63	< 0.50	107.44	7.90	2.53	116.52	119.05	80.3
	2277	< 0.050	0.99	< 0.50	229.22	12.35	2.47	243.10	245.57	184.8
	2280	< 0.050	< 0.50	14.51	143.96	5.49	2.75	164.51	167.26	69.8
	2284	< 0.050	2.33	< 0.50	288.00	17.49	7.00	308.37	315.37	248.9
	2373	< 0.050	< 0.50	< 0.50	101.70	5.02	4.19	107.77	111.95	46.9
Ashbridges Bay	2034	0.040	1.16	1.86	310.20	1.99	94.70	315.25	409.95	430.4
	2036	0.038	9.73	12.97	244.30	1.64	77.40	268.68	346.08	380.9

< Lower than detection limit

TABLE 2.4.4 (Cont'd): Distribution of Lead Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	1W	F1	F2	F3	F4	Residual	1W-F4	Sum	Total
Toronto Eastern	2038	0.010	1.18	1.52	42.00	0.65	41.10	45.36	86.46	90.2
Waterfront	2081	0.031	7.29	7.29	56.30	0.85	3.50	71.76	75.26	80.2
	2082	0.008	3.25	4.09	27.00	1.48	16.10	35.83	51.93	47.6
	2083	0.010	2.40	4.80	95.40	0.83	0.70	103.44	104.14	97.7
	2084	0.027	5.12	3.18	53.50	1.31	6.10	63.14	69.24	72.3
	2085	0.023	7.09	9.09	80.10	1.36	1.60	97.66	99.26	87.9
	2101	0.007	2.62	4.69	36.60	0.90	24.40	44.82	69.22	77.8
	2102	0.008	2.71	4.86	26.80	< 0.50	34.80	34.39	69.19	65.5
	2103	0.010	2.63	4.12	58.00	1.39	20.30	66.15	86.45	90.7
Frenchman Bay	2091	0.015	2.47	12.41	156.90	4.96	14.40	176.76	191.16	172.3
	2092	0.030	11.61	13.42	73.50	1.77	21.60	100.33	121.93	144.6
	2093	0.020	8.56	19.98	196.10	2.02	43.30	226.68	269.98	300.9
	2094	0.015	2.38	11.89	89.20	4.75	5.60	108.24	113.84	142.2
	2095	0.008	2.49	12.42	110.90	7.45	10.50	133.27	143.77	125.6
St. Clair River	0017	< 0.050	< 0.50	< 0.50	22.84	< 0.50	2.25	24.39	26.65	26.4
	0034	< 0.050	< 0.50	< 0.50	62.54	< 0.50	1.45	64.09	65.54	53.5
	0064	< 0.050	< 0.50	< 0.50	16.46	< 0.50	< 0.50	18.01	18.51	23.7
	0065	< 0.050	< 0.50	< 0.50	24.78	< 0.50	1.63	26.33	27.96	23.2
	0066	< 0.050	< 0.50	< 0.50	18.78	< 0.50	< 0.50	20.33	20.83	21.2
	0067	< 0.050	< 0.50	< 0.50	8.55	< 0.50	< 0.50	10.10	10.60	-
	0068	< 0.050	< 0.50	< 0.50	80.46	< 0.50	< 0.50	82.01	82.51	56.6
	0069	< 0.050	< 0.50	< 0.50	294.65	2.84	4.97	298.54	303.51	369.2
Niagara River	0113	< 0.050	< 0.50	< 0.50	178.30	7.75	9.01	187.10	196.11	172.5
	0126	< 0.050	< 0.50	< 0.50	26.81	< 0.50	< 0.50	28.36	28.86	23.1
	0127	< 0.050	< 0.50	< 0.50	154.34	6.19	5.82	161.57	167.40	139.2
	0148	< 0.050	< 0.50	< 0.50	26.86	0.60	2.17	28.51	30.68	25.2
	0156	< 0.050	< 0.50	< 0.50	117.73	1.94	4.17	120.72	124.89	100.6
	0157	< 0.050	< 0.50	< 0.50	152.96	4.53	3.40	158.54	161.94	145.1
	0160	< 0.050	< 0.50	< 0.50	25.89	< 0.50	< 0.50	27.44	27.94	60.4
	0183	< 0.050	< 0.50	< 0.50	158.81	5.51	6.24	165.37	171.61	91.2
	0184	< 0.050	< 0.50	< 0.50	62.57	< 0.50	1.48	64.12	65.60	44.0
St. Marys River	0044	< 0.050	< 0.50	< 0.50	30.57	1.29	5.17	32.91	38.07	19.4
	0045	< 0.050	< 0.50	< 0.50	48.73	4.37	6.87	54.15	61.03	38.7
	0046	< 0.050	< 0.50	< 0.50	204.56	10.46	11.62	216.07	227.69	185.0
	0047	< 0.050	< 0.50	< 0.50	147.13	8.31	9.98	156.49	166.47	125.5
	0048	< 0.050	< 0.50	< 0.50	589.18	28.06	25.05	618.28	643.33	593.2
	0049	< 0.050	< 0.50	< 0.50	86.40	15.97	8.60	103.43	112.02	105.7
	0050	< 0.050	< 0.50	< 0.50	12.57	0.70	3.84	14.32	18.16	11.5
	0051	< 0.050	< 0.50	< 0.50	13.80	0.73	3.63	15.58	19.21	12.0
St. Lawrence River	0356	< 0.050	< 0.50	< 0.50	9.70	< 0.50	0.69	11.25	11.95	11.4
	0357	< 0.050	< 0.50	< 0.50	17.06	< 0.50	< 0.50	18.61	19.11	15.2
	0358	< 0.050	< 0.50	< 0.50	25.49	< 0.50	< 0.50	27.04	27.54	21.2
	0359	< 0.050	< 0.50	< 0.50	5.78	< 0.50	< 0.50	7.33	7.83	9.2
	0360	< 0.050	< 0.50	< 0.50	51.08	< 0.50	2.27	52.63	54.90	48.8

< Lower than detection limit

- No data

TABLE 2.4.5: Distribution of Iron Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	1W	F1	F2	F3	F4	Residual	1W-F4	Sum	Total
Windermere Basin	2086	5.05	9.7	186.4	5202.0	< 0.2	6824.0	5903.2	12727.2	12380.0
	2087	3.53	12.3	364.4	7595.0	< 0.2	4986.0	7975.3	12961.3	13297.0
	2088	2.02	48.3	994.7	12982.0	< 0.2	5675.0	14027.1	19702.1	20047.0
	2089	1.76	47.6	1333.6	4752.0	< 0.2	10526.0	6135.0	16661.0	16390.0
	2090	1.77	22.0	993.6	4514.0	< 0.2	9918.0	5531.4	15449.0	15690.0
Outside Hamilton Harbour	2096	3.03	5.8	229.2	3722.0	< 0.2	21543.0	3960.0	25503.0	25840.0
	2097	2.27	6.5	333.3	3762.0	< 0.2	14073.0	4104.1	18177.0	18660.0
	2098	2.52	3.6	169.5	3600.0	< 0.2	14099.0	3775.7	17874.0	17459.0
	2099	3.53	5.6	137.4	1942.0	< 0.2	15181.0	2088.6	17269.0	17809.0
	2100	1.26	5.9	249.4	4697.0	< 0.2	13070.0	4953.6	18023.0	18667.0
Humber Bay	2113	< 0.02	1.0	156.5	9190.8	2210.8	33161.4	2368.3	35529.7	52039.8
	2115	5.44	43.1	99.2	13324.5	2268.0	28633.5	2415.8	31049.3	59109.8
	2118	< 0.02	1.5	100.5	7825.5	2009.3	27177.8	2111.2	29289.0	42194.3
	2330	1.16	3.0	56.2	7664.0	< 0.2	5302.0	7724.4	13026.0	13665.0
	2331	1.17	3.0	75.8	6979.0	< 0.2	5361.0	7059.0	12420.0	12780.0
	2334	0.97	1.3	37.1	2205.0	< 0.2	17872.0	2244.4	20116.0	19878.0
	2335	1.35	1.6	45.1	5755.0	< 0.2	5709.0	5803.1	11512.0	11229.0
	2336	1.77	2.7	97.3	2445.0	< 0.2	16084.0	2546.8	18630.0	18355.0
	2337	2.27	2.9	98.3	2792.0	< 0.2	15282.0	2895.5	18177.0	18443.0
	2339	1.51	5.1	185.1	3786.0	< 0.2	13743.0	3977.7	17720.0	18005.0
	2340	2.01	4.2	138.0	3248.0	< 0.2	9181.0	3392.2	12573.0	12790.0
	2367	1.67	4.6	455.7	10783.0	< 0.2	29029.0	11244.9	40273.0	40090.0
	2368	3.36	7.0	15.9	6347.0	< 0.2	4232.0	6373.3	10605.0	10224.0
	2369	1.11	1.7	43.9	5634.0	< 0.2	18023.0	5680.7	23703.0	23347.0
	2370	0.39	19.6	51.1	8715.6	1113.7	18157.5	1184.7	19342.2	41399.1
	2371	0.22	9.7	65.0	6185.4	1808.0	25931.1	1883.0	27814.1	32037.2
Toronto Harbour	1346	2.18	2.4	38.9	4673.0	< 0.2	6948.0	4716.4	11664.4	11024.0
	1352	2.27	4.8	204.1	12903.0	< 0.2	766.0	13114.1	13880.1	14050.0
	1354	1.78	2.4	56.0	8178.0	< 0.2	4787.0	8238.2	13027.2	13787.0
	1357	2.57	3.6	99.0	8767.0	< 0.2	4004.0	8872.2	12876.2	12440.0
	1362	1.57	2.0	67.7	8360.0	< 0.2	5201.0	8431.2	13632.2	14507.0
	1365	2.78	4.4	187.4	7484.0	< 0.2	5652.0	7678.6	13330.6	13895.0
	1366	3.03	11.3	220.8	7365.0	< 0.2	6034.0	7601.1	13634.1	13357.0
	1371	1.35	2.3	64.9	7997.0	< 0.2	4961.0	8065.5	13026.5	13757.0
	1375	0.78	1.4	21.0	1370.0	< 0.2	10723.0	1393.2	12116.2	12787.0
	1379	3.25	3.2	26.2	4544.0	< 0.2	13148.0	4576.7	17724.7	17505.0
East Headland	2108	0.58	< 0.2	18.3	3539.2	1238.7	18138.4	1257.8	19396.2	22120.0
	2277	< 0.02	< 0.2	67.8	8101.6	1679.6	26577.2	1747.6	28324.8	37939.2
	2280	0.03	< 0.2	27.9	8315.7	1239.5	22122.9	1267.7	23390.6	29026.5
	2284	0.05	0.9	55.5	9328.0	2262.0	29733.0	2318.5	32051.5	48622.2
	2373	< 0.02	0.8	54.7	4854.6	1908.4	29462.4	1964.0	31426.4	29462.4
Ashbridges Bay	2034	2.25	3.4	16.4	3899.0	< 0.2	6191.0	10112.0	3921.0	10922.0
	2036	0.26	3.1	52.9	5546.0	< 0.2	7423.0	13025.3	5602.3	13967.0

< Lower than detection limit

TABLE 2.4.5 (Cont'd): Distribution of Iron Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	1W	F1	F2	F3	F4	Residual	1W-F4	Sum	Total
Toronto Eastern	2038	0.26	2.7	11.6	7067.0	< 0.2	9731.0	7081.6	16812.6	17002.0
Waterfront	2081	0.23	1.0	109.9	3878.0	< 0.2	11411.0	3989.1	15400.1	15277.0
	2082	0.57	1.1	29.4	1893.0	< 0.2	13374.0	1924.0	15298.0	15677.0
	2083	0.57	1.6	29.7	2199.0	< 0.2	15945.0	2230.8	18175.8	18452.0
	2084	0.58	0.8	29.1	1797.0	< 0.2	16045.0	1827.5	17872.5	17445.0
	2085	0.32	1.6	53.4	5271.0	< 0.2	12849.0	5326.3	18175.3	18449.0
	2101	0.28	< 0.2	14.1	2009.0	< 0.2	15849.0	2023.3	17872.3	17005.0
	2102	0.45	1.7	13.7	1616.0	< 0.2	16088.0	1631.8	17719.8	18800.0
	2103	0.58	0.4	18.4	1750.0	< 0.2	15951.0	1769.3	17720.3	16509.0
Frenchman Bay	2091	1.77	7.1	139.3	20446.0	< 0.2	6734.0	20594.1	27328.1	27790.0
	2092	2.23	2.9	87.4	8599.0	< 0.2	17250.0	8691.5	25941.5	23698.0
	2093	2.28	2.9	105.4	6210.0	< 0.2	40893.0	6320.6	47213.6	46890.0
	2094	1.01	7.4	116.3	15691.0	< 0.2	1602.0	15815.7	17417.7	17002.0
	2095	1.26	7.6	143.0	11713.0	< 0.2	6159.0	11864.9	18023.9	17760.0
St. Clair River	0017	1.34	1.2	30.2	3088.8	527.7	10682.1	560.4	11242.5	14929.0
	0034	0.09	1.0	35.1	3325.8	361.5	10555.8	397.7	10953.5	14315.4
	0064	0.31	0.6	28.0	3980.6	474.6	10717.0	503.5	11220.5	15310.0
	0065	0.29	2.8	211.3	5687.5	796.3	14462.5	1010.6	15473.1	17712.5
	0066	1.25	2.9	76.4	4396.8	659.5	12274.4	740.1	13014.5	15205.6
	0067	< 0.02	1.1	10.5	2104.0	341.9	5523.0	353.5	5876.5	-
	0068	0.41	3.1	285.7	3454.0	628.0	10205.0	917.3	11122.3	15072.0
	0069	0.23	2.8	106.5	7242.0	340.8	6248.0	450.4	6698.4	18744.0
Niagara River	0113	11.43	< 0.2	678.3	9302.4	736.4	26356.8	1426.4	27783.2	49322.1
	0126	15.30	< 0.2	47.6	3784.8	298.1	13956.4	361.2	14317.6	19870.2
	0127	< 0.02	< 0.2	66.4	7134.4	844.5	21985.6	911.1	22896.7	32905.6
	0148	< 0.02	< 0.2	19.6	2776.1	422.5	18527.5	442.2	18969.7	24260.7
	0156	3.88	< 0.2	217.1	6976.8	600.8	20542.8	821.9	21364.7	30426.6
	0157	2.95	< 0.2	258.3	7931.0	725.1	28551.6	986.6	29538.2	39541.7
	0160	1.07	< 0.2	71.1	3198.3	319.8	22388.1	392.2	22780.3	29089.3
	0183	< 0.02	< 0.2	196.5	11934.0	1211.8	33415.2	1408.4	34823.6	48195.0
	0184	10.78	< 0.2	182.5	5909.2	521.4	18422.8	714.9	19137.7	30154.3
St. Marys River	0044	0.14	0.7	328.9	1412.0	516.6	29274.0	846.3	30120.3	27035.4
	0045	0.40	< 0.2	524.8	4498.2	1249.5	25614.8	1774.9	27389.6	27738.9
	0046	0.46	13.5	757.8	12552.3	1720.1	122036.3	2491.9	124528.1	174337.5
	0047	0.27	3.0	568.6	7315.0	1064.0	51038.8	1635.8	52674.6	71321.3
	0048	0.40	13.6	1002.0	10821.6	1442.9	165330.0	2458.9	167788.9	195390.0
	0049	0.10	0.3	589.7	5241.6	2506.1	27027.0	3096.2	30123.2	61425.0
	0050	0.06	0.6	181.6	2402.8	530.9	13970.0	713.1	14683.1	16205.2
	0051	0.09	0.7	85.7	2760.7	537.6	15401.8	624.2	16026.0	16854.8
St. Lawrence River	0356	< 0.02	8.5	28.7	1704.8	145.5	29452.5	182.8	29635.3	19958.4
	0357	< 0.02	2.0	7.1	2729.2	270.4	12635.0	279.5	12914.5	18699.8
	0358	< 0.02	1.2	17.0	5341.6	582.7	20638.0	601.0	21239.0	23673.0
	0359	< 0.02	0.9	12.3	3537.4	1225.4	16530.8	1238.6	17769.4	19652.0
	0360	0.05	0.9	62.0	7264.0	1180.4	24175.5	1243.3	25418.8	36093.0

< Lower than detection limit

- No data

TABLE 2.4.6: Distribution of Manganese Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Windermere Basin	2086	1.860	2.78	176.60	276.40	30.83	51.500	488.47	539.97	540.5
	2087	1.870	10.12	264.40	271.64	36.63	7.30	584.66	591.96	612.3
	2088	1.850	14.29	229.70	227.33	67.05	47.00	540.22	587.22	560.9
	2089	1.870	16.33	334.40	210.00	127.72	14.90	690.32	705.22	735.5
	2090	3.790	11.67	315.20	272.02	81.71	23.30	684.39	707.69	682.2
Outside Hamilton Harbour	2096	3.670	8.69	207.60	211.33	19.33	40.80	450.62	491.42	495.0
	2097	31.550	29.05	346.20	208.40	31.41	9.90	646.61	656.51	600.8
	2098	7.420	13.61	329.00	341.10	18.90	6.50	710.03	716.53	760.9
	2099	11.140	12.64	233.30	384.23	15.71	15.00	657.02	672.02	680.9
	2100	16.700	14.15	262.50	260.05	25.00	23.00	578.40	601.40	617.9
Humber Bay	2113	1.167	136.35	169.67	561.46	114.14	728.05	982.80	1710.85	1081.8
	2115	0.170	143.08	172.01	831.93	96.46	723.42	1243.65	1967.07	1146.8
	2118	0.212	108.70	110.49	326.55	72.47	494.31	618.43	1112.73	854.5
	2330	1.910	2.36	23.33	201.10	14.16	179.00	242.86	421.86	397.5
	2331	1.310	2.97	23.10	205.01	15.75	173.00	248.14	421.14	443.4
	2334	0.850	4.03	22.28	136.43	9.90	126.00	173.49	299.49	305.5
	2335	1.900	2.77	15.08	137.33	11.46	201.00	168.54	369.54	354.9
	2336	7.420	7.22	150.40	179.70	8.94	73.20	353.68	426.88	440.6
	2337	3.760	3.25	106.20	117.07	63.60	106.90	293.88	400.78	427.7
	2339	18.600	3.74	180.30	218.91	18.31	18.30	439.86	458.16	421.0
	2340	5.570	5.68	139.90	187.33	8.60	78.50	347.08	425.58	460.9
	2367	4.500	7.70	66.58	218.41	40.98	192.50	338.17	530.67	509.8
	2368	2.220	1.32	20.63	254.00	23.43	184.00	301.60	485.60	500.2
	2369	0.500	2.04	1.81	172.72	14.48	115.50	191.55	307.05	289.5
	2370	1.283	62.71	117.80	442.47	31.65	378.01	655.91	1033.91	861.9
	2371	0.428	85.02	111.44	411.28	87.54	355.94	695.70	1051.64	804.9
Toronto Harbour	1346	2.660	1.41	12.26	117.01	9.06	269.80	142.40	412.20	389.7
	1352	3.770	6.08	163.30	207.50	10.50	62.60	391.15	453.75	489.0
	1354	2.520	2.70	22.91	188.22	11.45	205.20	227.80	433.00	400.9
	1357	2.720	3.18	24.02	137.70	13.00	252.60	180.62	433.22	407.9
	1362	3.200	2.73	19.76	191.10	11.12	216.30	227.91	444.21	467.3
	1365	1.800	6.69	175.80	225.71	15.75	60.50	425.75	486.25	530.9
	1366	3.670	5.19	140.50	218.90	13.26	271.60	381.52	653.12	670.9
	1371	4.120	2.81	19.72	165.79	10.81	262.90	203.25	466.15	435.5
	1375	4.090	1.63	15.75	89.72	8.01	357.40	119.20	476.60	500.9
	1379	4.100	6.75	32.77	161.60	12.09	353.70	217.31	571.01	602.2
East Headland	2108	2.275	47.46	116.65	190.16	55.13	205.34	411.68	617.02	554.3
	2277	1.976	73.39	162.78	486.00	72.61	472.34	796.75	1269.08	776.6
	2280	1.789	51.20	94.28	525.54	46.77	313.85	719.58	1033.43	720.2
	2284	3.801	115.84	215.36	579.19	116.93	584.63	1031.12	1615.75	854.7
	2373	0.285	118.53	123.57	488.97	91.91	491.78	823.27	1315.05	726.5
Ashbridges Bay	2034	2.400	1.15	7.42	64.90	7.96	347.80	83.83	431.63	479.2
	2036	5.010	3.75	40.01	258.01	10.03	192.20	316.81	509.01	535.2

TABLE 2.4.6 (Cont'd): Distribution of Manganese Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Toronto Eastern	2038	3.000	1.00	6.02	39.90	7.92	292.70	57.84	350.54	337.0
Waterfront	2081	0.340	0.79	49.14	71.44	13.41	443.00	135.12	578.12	602.4
	2082	5.720	1.35	22.02	102.33	5.50	320.20	136.92	457.12	477.7
	2083	4.320	1.27	34.29	112.92	6.27	328.40	159.07	487.47	510.9
	2084	1.100	1.04	35.26	124.72	6.27	326.00	168.39	494.39	524.4
	2085	0.340	2.11	58.42	206.21	11.93	267.00	279.01	546.01	579.9
	2101	3.000	0.89	32.92	70.30	9.12	369.80	116.23	486.03	502.0
	2102	< 0.010	1.09	21.95	88.87	9.55	350.90	121.46	472.36	430.8
	2103	7.310	5.71	34.70	104.47	19.12	391.60	171.31	562.91	590.8
Frenchman Bay	2091	1.800	1.29	291.40	195.00	17.14	30.70	506.63	537.33	580.9
	2092	0.810	12.67	48.88	229.01	12.67	144.40	304.04	448.44	482.5
	2093	1.100	9.62	90.00	287.70	15.02	145.70	403.44	549.14	530.0
	2094	3.730	1.22	131.70	300.00	12.17	16.90	448.82	465.72	470.5
	2095	3.700	1.54	82.66	266.02	17.87	178.20	371.79	549.99	513.3
St. Clair River	0017	< 0.010	6.30	23.19	188.02	16.32	92.03	233.83	325.87	246.5
	0034	6.883	6.17	52.70	191.78	13.18	96.90	270.71	367.62	258.1
	0064	< 0.010	2.58	67.01	234.31	15.70	102.54	319.61	422.15	211.3
	0065	0.618	24.03	48.59	275.19	24.69	142.21	373.13	515.34	276.3
	0066	< 0.010	27.52	64.94	268.14	25.67	107.16	386.28	493.44	230.8
	0067	0.868	0.52	47.19	94.39	7.78	44.70	150.74	195.44	-
	0068	< 0.010	7.15	38.69	127.65	14.66	76.13	188.16	264.28	274.0
	0069	< 0.010	67.33	84.67	1151.08	22.07	53.24	1325.16	1378.40	1272.3
Niagara River	0113	21.899	190.46	242.30	409.46	30.24	358.75	894.36	1253.11	825.6
	0126	2.681	1.99	61.44	156.71	9.95	190.28	232.76	423.05	440.0
	0127	1.019	45.36	205.61	360.34	35.19	346.57	647.52	994.08	690.1
	0148	< 0.010	11.22	107.83	220.77	20.40	209.11	360.23	569.33	473.1
	0156	0.581	69.87	121.34	262.96	22.16	309.91	476.91	786.83	449.6
	0157	0.680	97.54	182.76	382.46	30.03	518.50	693.47	1211.97	588.0
	0160	< 0.010	8.81	21.91	143.77	12.99	432.46	187.48	619.94	373.1
	0183	0.184	38.42	158.73	554.37	37.91	512.25	789.62	1301.86	672.0
	0184	0.174	4.23	79.43	234.05	19.93	291.43	337.81	629.24	542.3
St. Marys River	0044	1.567	19.27	20.90	42.98	12.75	666.98	97.46	764.45	421.9
	0045	0.450	21.86	45.90	63.07	30.91	836.75	162.18	998.93	399.8
	0046	2.929	188.03	155.62	432.26	137.24	7424.14	916.09	8340.22	534.6
	0047	2.095	121.59	77.93	167.47	56.37	2465.01	425.46	2890.47	1030.8
	0048	6.573	311.64	281.12	722.89	130.12	9132.46	1452.34	10584.80	2885.8
	0049	1.278	289.72	232.05	346.06	110.52	836.97	979.62	1816.60	1621.6
	0050	< 0.010	48.60	170.79	108.33	14.15	303.53	341.89	645.41	447.0
	0051	< 0.010	14.56	109.76	113.98	13.51	328.21	251.81	580.03	363.3
St. Lawrence River	0356	< 0.010	26.70	23.82	81.63	3.84	331.33	135.99	467.32	247.4
	0357	< 0.010	10.85	121.31	189.62	11.17	520.34	332.97	853.31	422.0
	0358	< 0.010	12.97	80.19	283.90	18.87	689.84	395.93	1085.77	398.2
	0359	0.069	11.22	136.02	291.27	37.68	352.73	476.26	828.99	343.3
	0360	0.363	57.20	105.13	345.27	40.45	458.64	548.41	1007.05	559.6

< Lower than detection limit

- No data

TABLE 2.4.7: Distribution of Arsenic Among Geochemical Forms
(ug/g Dry Weight)

Location	Station	IW	F1	F2	F3	F4	Residual	IW-F4	Sum	Total
Humber Bay	2113	0.012	< 0.01	0.21	7.96	0.17	4.87	8.37	13.24	13.26
	2115	< 0.001	0.09	0.34	9.71	0.18	2.44	10.32	12.76	14.54
	2118	0.008	< 0.01	0.19	6.55	0.12	2.66	6.87	9.54	7.40
	2370	0.005	0.06	0.29	6.90	0.10	1.62	7.35	8.97	8.26
	2371	0.013	0.05	0.24	5.04	0.10	3.40	5.43	8.83	6.55
East Headland	2108	0.016	0.01	0.11	2.82	0.09	2.71	3.05	5.76	6.00
	2277	0.008	0.02	0.26	6.93	0.19	3.78	7.40	11.18	11.62
	2280	0.014	0.05	0.23	6.03	0.14	2.75	6.46	9.21	5.31
	2284	0.014	0.05	0.45	16.25	0.40	6.41	17.17	23.58	22.13
	2373	0.015	0.03	0.14	3.04	0.11	4.25	3.33	7.58	5.97
St. Clair River	0017	0.003	< 0.01	0.08	1.80	< 0.01	2.83	1.91	4.74	4.31
	0034	0.003	< 0.01	0.09	2.53	< 0.01	2.39	2.64	5.03	4.99
	0064	0.006	0.02	0.03	2.53	< 0.01	2.30	2.59	4.88	5.05
	0065	0.033	< 0.01	0.09	3.90	0.24	2.60	4.28	6.88	5.85
	0066	0.004	< 0.01	0.15	4.40	< 0.01	2.47	4.57	7.04	5.86
	0067	< 0.001	< 0.01	0.03	1.97	< 0.01	1.84	2.02	3.86	-
	0068	0.003	< 0.01	0.31	3.45	< 0.01	1.96	3.78	5.75	5.02
	0069	< 0.001	< 0.01	0.16	4.83	< 0.01	2.27	5.01	7.28	6.82
Niagara River	0113	< 0.001	0.05	0.61	6.07	0.09	5.61	6.81	12.42	16.94
	0126	< 0.001	< 0.01	< 0.01	1.68	< 0.01	1.68	1.71	3.39	3.54
	0127	< 0.001	< 0.01	0.11	4.38	0.10	3.75	4.60	8.35	9.47
	0148	< 0.001	< 0.01	0.05	1.56	0.04	3.19	1.66	4.86	5.07
	0156	< 0.001	< 0.01	0.11	4.32	< 0.01	3.27	4.45	7.71	7.42
	0157	< 0.001	< 0.01	0.20	5.33	0.05	3.66	5.59	9.24	8.95
	0160	< 0.001	< 0.01	0.02	1.27	0.02	1.31	1.32	2.63	4.66
	0183	< 0.001	< 0.01	0.12	5.59	0.11	5.52	5.83	11.35	8.61
	0184	< 0.001	< 0.01	0.04	3.38	0.03	3.15	3.46	6.61	5.64
St. Marys River	0044	0.002	< 0.01	0.33	3.08	0.11	0.01	3.53	3.55	4.16
	0045	0.007	< 0.01	0.17	2.87	0.35	4.17	3.42	7.59	6.72
	0046	0.005	0.09	1.95	18.92	0.53	6.14	21.51	27.64	34.26
	0047	0.003	0.07	1.45	11.50	0.27	4.46	13.29	17.74	16.44
	0048	< 0.001	0.26	2.55	34.67	0.68	17.92	38.16	56.07	56.91
	0049	0.015	< 0.01	0.22	4.52	0.43	6.39	5.19	11.58	15.03
	0050	< 0.001	< 0.01	0.04	1.11	0.06	1.55	1.22	2.77	2.84
	0051	< 0.001	< 0.01	0.03	1.02	0.03	1.69	1.09	2.77	2.28
St. Lawrence River	0356	0.004	< 0.01	0.05	1.22	< 0.01	0.35	1.29	1.64	1.77
	0357	0.005	< 0.01	0.05	1.24	< 0.01	0.38	1.31	1.69	1.26
	0358	0.010	< 0.01	0.07	3.04	0.02	0.93	3.15	4.09	2.99
	0359	0.025	0.02	0.06	1.76	0.13	1.08	1.99	3.07	2.44
	0360	0.009	< 0.01	0.09	4.94	0.05	1.71	5.09	6.81	8.55

< Lower than detection limit

- No data

geochemical phases. Total is the total metal based on a bulk analysis and which theoreticaly is equal to the Sum. Where the results for the Sum and Total metal are not similar the data are unreliable and should be interpreted with caution.

3.0 BIOLOGICAL RESULTS

The benthic invertebrate samples were collected with a 23 x 23 cm Ponar grab sampler and sieved through a US # 30 mesh. In the laboratory the organisms were hand-picked and cleaned under running water. The organisms were blotted dry and then subsampled into three portions for identification, metal analysis, and PCB/pesticides analysis.

3.1 Metal Analysis

Analyses were carried out for cadmium, copper, iron, lead, manganese, zinc, mercury and arsenic on the benthic samples. Mercury analysis consisted of digesting the organisms in a sulphuric acid - potassium permanganate solution and determinations of mercury concentrations were made by automated stannous chloride reduction and cold vapour atomic absorption spectrophotometry (AAS). The other metals were analysed by digesting the organisms in nitric acid-perchloric acid solution and chemical determinations were made by flame AAS.

3.2 PCBs and Pesticides Analysis

The frozen samples were homogenized and digested for 12 hours in concentrated hydrochloric acid at 25°C. The digest was then extracted with a methylene chloride/hexane mixture. The extract was neutralized with sodium bicarbonate, dried by filtering though anhydrous sodium sulphate and evaporated.

The residue was placed in a clean-up column with 5 g of 100/200 mesh Florisil. The column was eluted successively with hexane, 25% methylene chloride/hexane and methylene chloride to obtain values for the PCBs and organochlorine pesticides. The compounds determined in each of the three fractions are shown below.

I - Hexane fraction: PCBs, HCB, Heptachlor, Aldrin, p,p'-DDE, Mirex

II - 25% Methylene chloride/hexane fraction:
alpha-chlordane
gamma-chlordane
o,p'-DDT, p,p'-DDD, p,p'-DDT.

III - Methylene chloride fraction: Heptachlor epoxide, alpha-endosulfan, beta-endosulfan, dieldrin, endrin.

All fractions were evaporated to near dryness and made up to 5 mL in iso-octane. Each fraction was analyzed by a "Varian Vista 6000" gas chromatograph interfaced to a "Vista 402" chromatography data system.

TABLE 3.1: Metal Analysis of Biota (Oligochaetes)
(ug/g Wet Weight, not corrected for gut content)

Location	Station	Replicate	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Zinc	% Ash
Windermere Basin	2089	A	< 0.1	4.0	200.0	< 0.4	4.0	0.015	24.0	1.06
		B	< 0.1	6.0	260.0	< 0.4	5.0	0.014	28.0	0.78
	2090	A	< 0.1	7.0	360.0	< 0.4	6.0	0.021	34.0	0.38
Outside Hamilton Harbour	2097	A	< 0.1	7.0	360.0	< 0.4	6.0	0.021	34.0	2.71
Humber Bay	2113	A	< 0.1	4.1	241.0	2.0	5.3	0.031	21.0	1.99
	2115	A	< 0.1	3.8	115.0	< 1.0	3.1	0.021	14.0	0.86
	2118	A	< 0.1	8.1	274.0	2.0	4.7	0.053	37.0	1.66
	2330	A	< 0.1	5.0	190.0	< 0.4	2.0	0.031	87.0	0.56
		B	< 0.1	6.0	190.0	< 0.4	4.0	0.028	23.0	0.66
	2331	A	< 0.1	4.0	230.0	< 0.4	2.0	0.019	23.0	0.68
	2334	A	< 0.1	3.0	180.0	< 0.4	4.0	0.023	25.0	0.35
		B	< 0.1	4.0	260.0	< 0.4	6.0	0.025	24.0	0.50
	2335	A	< 0.1	13.0	760.0	< 0.4	15.0	0.055	65.0	0.76
	2369	A	< 0.1	3.0	145.0	< 0.4	2.0	0.014	14.0	1.03
		B	< 0.1	4.0	250.0	< 0.4	3.0	0.013	17.0	1.03
	2370	A	< 0.1	3.7	184.0	< 1.0	4.3	0.028	17.0	1.13
	2371	A	< 0.1	3.5	181.0	2.0	4.1	0.022	31.0	1.12
Toronto Harbour	1346	A	< 0.1	4.0	300.0	< 0.4	3.0	0.032	32.0	1.67
		B	< 0.1	4.0	260.0	< 0.4	3.0	0.042	30.0	0.75
	1352	A	< 0.1	5.0	270.0	< 0.4	3.0	0.042	32.0	0.78
		B	< 0.1	9.0	440.0	< 0.4	7.0	0.046	35.0	0.90
	1354	A	< 0.1	8.0	510.0	11.0	3.0	0.068	45.0	1.90 *
		B	< 0.1	6.0	440.0	8.0	3.0	0.056	33.0	1.90 *
	1357	A	< 0.1	5.0	540.0	3.0	7.0	0.036	28.0	1.90 *
		B	< 0.1	6.0	530.0	4.0	5.0	0.032	30.0	1.90 *
	1362	A	< 0.1	8.0	790.0	9.0	7.0	0.066	36.0	1.90 *
		B	< 0.1	11.0	900.0	8.0	8.0	0.084	47.0	1.90 *
	1365	A	< 0.1	4.0	320.0	1.3	4.0	0.043	36.0	0.72
		B	< 0.1	6.0	560.0	1.0	8.0	0.061	40.0	1.24
	1366	A	< 0.1	8.0	400.0	2.0	3.0	0.047	45.0	1.86
	1371	A	< 0.1	11.0	500.0	7.0	5.0	0.047	37.0	1.54
		B	< 0.1	14.0	640.0	7.0	6.0	0.056	38.0	1.35
	1379	A	< 0.1	5.0	170.0	< 0.4	2.0	0.041	31.0	1.86
		B	< 0.1	7.0	140.0	< 0.4	2.0	0.048	30.0	1.79

\- No Data
< Lower than detection limit
* Results estimated

TABLE 3.1 (cont'd): Metal Analysis of Biota (Oligochaetes)
(ug/g Wet Weight, not corrected for gut content)

Location	Station	Replicate	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Zinc	% Ash
East Headland	2108	A	0.2	8.8	758.0	4.0	18.8	0.036	6.0	11.77
	2277	A	0.2	12.4	376.0	4.0	9.0	0.068	2.0	2.06
	2280	A	0.2	11.2	629.0	5.0	10.3	0.065	3.0	2.40
	2284	A	< 0.1	9.0	405.0	5.0	4.7	0.081	2.0	1.80
	2373	A	< 0.1	4.9	171.0	6.0	4.6	0.044	5.0	1.92
Ashbridges Bay	2034	A	< 0.1	6.0	990.0	< 0.4	13.0	0.030	38.0	2.27
Toronto Eastern Waterfront	2101	A	< 0.1	2.0	200.0	< 0.4	3.0	0.019	20.0	1.41
		B	< 0.1	3.0	120.0	< 0.4	1.0	0.020	23.0	0.93
	2102	A	< 0.1	12.0	390.0	< 0.4	3.0	0.058	33.0	2.24
	2103	A	< 0.1	3.0	160.0	< 0.4	1.0	0.018	19.0	1.36
		B	< 0.1	2.0	180.0	< 0.4	1.0	0.013	18.0	1.36
	2082	A	< 0.1	7.0	710.0	< 0.4	8.0	0.035	33.0	2.30
		B	< 0.1	6.0	360.0	< 0.4	4.0	0.037	41.0	3.42
	2083	A	< 0.1	3.0	400.0	< 0.4	7.0	0.020	7.0	2.66
		B	< 0.1	5.0	500.0	< 0.4	8.0	0.034	13.0	2.66
St. Clair River	0066	A	< 0.1	1.6	157.0	< 1.0	3.2	-	13.0	2.71
Niagara River	0113	A	< 0.1	8.8	1640.0	10.0	24.6	0.044	45.0	1.84
	0157	A	< 0.1	2.8	223.0	< 1.0	3.0	-	27.0	2.71
	0160	A	< 0.1	2.1	330.0	< 1.0	5.2	-	21.0	2.71
	0183	A	< 0.1	3.7	387.0	< 1.0	8.4	-	29.0	2.71
St. Marys River	0045	A	< 0.1	3.6	223.0	< 1.0	7.0	0.081	21.0	1.21
	0046	A	< 0.1	4.2	324.0	< 1.0	5.6	0.053	20.0	1.25
	0047	A	< 0.1	2.0	227.0	< 1.0	3.0	0.011	18.0	1.21
	0048	A	< 0.1	3.0	272.0	2.0	3.6	0.006	19.0	0.92
	0050	A	0.2	2.4	680.0	< 1.0	35.8	0.002	31.0	1.17
	0051	A	0.4	1.4	558.0	< 1.0	19.9	0.005	26.0	1.17
St. Lawrence River	0356	A	< 0.1	23.4	60.0	< 1.0	6.8	0.043	16.0	5.15
		B	< 0.1	22.7	60.0	< 1.0	7.1	0.053	16.0	5.15
	0357	A	< 0.1	1.2	112.0	< 1.0	4.8	-	22.0	1.99
	0360	A	< 0.1	2.8	994.0	< 1.0	22.9	-	12.0	1.84

- No Data
< Lower than detection limit

TABLE 3.2: PCBs and Pesticides Analysis of Biota (Oligochaetes)
(ug/g Wet Weight, not corrected for gut content)

Location	Station	Replicate	Aldrin	A-BHC Hexachloro-cyclohexane	B-BHC Hexachloro-cyclohexane	G-BHC Lindane	Chlordane	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endrin
Windermere Basin	2089	A	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	< 0.002	< 0.002	< 0.002	0.002	< 0.01	< 0.01	< 0.01	< 0.01
	2090	A	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
Outside Hamilton Harbour	2097	A	0.003	0.005	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.002	0.006	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
Humber Bay	2330	A	0.008	0.002	< 0.002	< 0.002	0.027	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.004	0.031	< 0.002	< 0.002	0.033	< 0.01	< 0.01	< 0.01	< 0.01
	2331	A	0.007	0.002	< 0.002	< 0.002	0.020	< 0.01	< 0.01	< 0.01	< 0.01
	2334	A	0.004	0.008	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.003	0.005	< 0.002	< 0.002	0.017	< 0.01	< 0.01	< 0.01	< 0.01
	2335	A	0.008	0.006	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	2369	A	0.003	< 0.002	< 0.002	< 0.002	0.006	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.004	0.002	< 0.002	< 0.002	0.012	< 0.01	< 0.01	< 0.01	< 0.01
Toronto Harbour	1346	A	0.006	< 0.002	0.004	< 0.002	0.014	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.006	0.002	< 0.002	< 0.002	0.019	< 0.01	< 0.01	< 0.01	< 0.01
	1352	A	0.004	0.005	< 0.002	< 0.002	0.016	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.004	0.003	< 0.002	0.003	0.006	< 0.01	< 0.01	< 0.01	< 0.01
	1354	A	< 0.002	0.003	< 0.002	0.011	0.013	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	0.002	< 0.002	0.012	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	1357	A	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	1362	A	< 0.002	0.003	< 0.002	0.009	0.015	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	0.002	< 0.002	0.015	0.012	< 0.01	< 0.01	< 0.01	< 0.01
	1365	A	0.003	0.003	< 0.002	< 0.002	0.009	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.005	0.002	< 0.002	< 0.002	0.015	< 0.01	< 0.01	< 0.01	< 0.01
	1366	A	0.007	0.003	< 0.002	< 0.002	0.025	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	1371	A	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	1379	A	< 0.002	0.003	< 0.002	< 0.002	0.004	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	0.003	< 0.002	< 0.002	0.006	< 0.01	< 0.01	< 0.01	< 0.01
Ashbridges Bay	2034	A	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
Toronto Eastern Waterfront	2101	A	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	2102	A	< 0.002	0.008	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	2103	A	0.031	0.005	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	0.032	0.005	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	2082	A	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
		B	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01
	2083	A	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.01	< 0.01	< 0.01	< 0.01

< Lower than detection limit

TABLE 3.2 (cont'd): PCBs and Pesticides Analysis of Biota (Oligochaetes)
(ug/g Wet Weight, not corrected for gut content)

Location	Station	Replicate	Hepta-chlor-epoxide	Hepta-chlor	Mirex	OP-DDT	PCB Total	PP-DDD	PP-DDE	PP-DDT	Hexa-chloro-benzene
Windermere Basin	2089	A	< 0.01	< 0.002	< 0.002	< 0.01	0.260	< 0.002	0.013	< 0.01	0.00[illegible]
		B	< 0.01	< 0.002	< 0.002	< 0.01	0.260	< 0.002	0.008	< 0.01	0.0[illegible]
	2090	A	< 0.01	0.002	< 0.002	< 0.01	0.160	< 0.002	0.011	< 0.01	0.0[illegible]
		B	< 0.01	0.002	< 0.002	< 0.01	0.250	< 0.002	0.016	< 0.01	0.0[illegible]
Outside Hamilton Harbour	2097	A	< 0.01	0.003	< 0.002	< 0.01	0.250	< 0.002	0.029	< 0.01	0.00[illegible]
		B	< 0.01	0.002	< 0.002	< 0.01	0.310	< 0.002	0.036	< 0.01	0.0[illegible]
Humber Bay	2330	A	< 0.01	0.003	< 0.002	< 0.01	0.220	0.026	0.029	< 0.01	0.0[illegible]
		B	< 0.01	< 0.002	< 0.002	< 0.01	0.290	0.005	0.012	< 0.01	0.0[illegible]
	2331	A	< 0.01	0.003	< 0.002	< 0.01	0.280	0.014	0.020	< 0.01	0.0[illegible]
	2334	A	< 0.01	0.004	< 0.002	< 0.01	0.260	< 0.002	0.020	< 0.01	0.0[illegible]
		B	< 0.01	0.004	< 0.002	< 0.01	0.270	0.018	0.020	< 0.01	0.0[illegible]
	2335	A	< 0.01	0.004	< 0.002	< 0.01	0.600	< 0.002	0.051	< 0.01	0.0[illegible]
	2369	A	< 0.01	< 0.002	< 0.002	< 0.01	0.220	< 0.002	0.014	< 0.01	0.012
		B	< 0.01	0.002	< 0.002	< 0.01	0.390	< 0.002	0.020	< 0.01	0.0[illegible]
Toronto Harbour	1346	A	< 0.01	0.004	< 0.002	< 0.01	0.210	< 0.002	< 0.002	< 0.01	0.0[illegible]
		B	< 0.01	0.004	< 0.002	< 0.01	0.250	< 0.002	< 0.002	< 0.01	0.0[illegible]
	1352	A	< 0.01	0.003	< 0.002	< 0.01	0.220	< 0.002	< 0.002	< 0.01	0.0[illegible]
		B	< 0.01	0.003	< 0.002	< 0.01	0.190	< 0.002	< 0.002	< 0.01	0.0[illegible]
	1354	A	< 0.01	0.009	< 0.002	< 0.01	0.140	< 0.002	< 0.002	< 0.01	< 0.00[illegible]
		B	< 0.01	0.015	< 0.002	< 0.01	0.220	< 0.002	< 0.002	< 0.01	< 0.00[illegible]
	1357	A	< 0.01	< 0.002	< 0.002	< 0.01	0.140	< 0.002	0.007	< 0.01	0.0[illegible]
		B	< 0.01	0.002	< 0.002	< 0.01	0.190	< 0.002	0.013	< 0.01	0.003
	1362	A	< 0.01	< 0.002	< 0.002	< 0.01	0.080	0.011	< 0.002	< 0.01	0.0[illegible]
		B	< 0.01	< 0.002	< 0.002	< 0.01	0.100	0.010	< 0.002	< 0.01	< 0.00[illegible]
	1365	A	< 0.01	0.003	< 0.002	< 0.01	0.180	0.028	< 0.002	< 0.01	0.00[illegible]
		B	< 0.01	0.002	< 0.002	< 0.01	0.180	0.015	< 0.002	< 0.01	0.00[illegible]
	1366	A	< 0.01	0.003	< 0.002	< 0.01	0.320	0.032	< 0.002	< 0.01	0.007
		B	< 0.01	< 0.002	< 0.002	< 0.01	0.130	0.008	< 0.002	< 0.01	0.00[illegible]
	1371	A	< 0.01	< 0.002	< 0.002	< 0.01	< 0.040	< 0.002	< 0.002	< 0.01	< 0.00[illegible]
		B	< 0.01	< 0.002	< 0.002	< 0.01	< 0.040	< 0.002	< 0.002	< 0.01	< 0.00[illegible]
	1379	A	< 0.01	< 0.002	< 0.002	< 0.01	0.050	< 0.002	< 0.002	< 0.01	0.00[illegible]
		B	< 0.01	< 0.002	< 0.002	< 0.01	< 0.040	< 0.002	< 0.002	< 0.01	0.00[illegible]
Ashbridges Bay	2034	A	< 0.01	< 0.002	< 0.002	< 0.01	0.110	< 0.002	< 0.002	< 0.01	0.0[illegible]
Toronto Eastern Waterfront	2101	A	< 0.01	< 0.002	< 0.002	< 0.01	0.060	< 0.002	< 0.002	< 0.01	0.070
		B	< 0.01	< 0.002	< 0.002	< 0.01	< 0.040	< 0.002	< 0.002	< 0.01	< 0.00[illegible]
	2102	A	< 0.01	< 0.002	< 0.002	< 0.01	0.020	< 0.002	< 0.002	< 0.01	0.0[illegible]
		B	< 0.01	< 0.002	< 0.002	< 0.01	0.070	< 0.002	< 0.002	< 0.01	0.004
	2103	A	< 0.01	0.026	< 0.002	< 0.01	0.230	< 0.002	< 0.002	< 0.01	0.00[illegible]
		B	< 0.01	0.023	< 0.002	< 0.01	0.240	< 0.002	< 0.002	< 0.01	0.0[illegible]
	2082	A	< 0.01	< 0.002	< 0.002	< 0.01	< 0.002	< 0.002	< 0.002	< 0.01	< 0.002
		B	< 0.01	< 0.002	< 0.002	< 0.01	< 0.002	< 0.002	< 0.002	< 0.01	< 0.002
	2083	A	< 0.01	< 0.002	< 0.002	< 0.01	< 0.002	< 0.002	< 0.002	< 0.01	< 0.002

< Lower than detection limit

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10850-06B.1
ABS/88-1.0

APPENDIX I

Analytical Detection Limits for Metals in Sediment and Biota
Units: ug/g

	Bulk Sediment (Dry Weight)	Geochemical Forms (Dry Weight)	Biota (Wet weight)
Cu	2.0	0.1	0.4
Cr	2.0	--	--
Hg	0.01	--	0.005
Cd	0.20	0.05	0.1
Fe	20.0	0.2	0.4
Pb	2.0	0.5	1.0
Zn	2.0	0.05	0.2
As	0.03	0.01	0.001
Mn	2.0	0.1	0.20

-- No Analysis Done

NOTE: In some tables the detection limits appear higher than are listed in this table. This is due to a small sample size.

APPENDIX II

Analytical Detection Limits for Organic Contaminants in Sediment and Biota Units: ug/g

	Bulk Sediment (Dry Weight)	Biota (Wet Weight)
Aldrin	0.001	0.002
A-BHC Hexachlorocylohexane	0.001	0.002
B-BHC	0.001	0.002
G-BHC	0.001	0.002
A Chlordane	0.002	0.010
G Chlordane	0.002	0.010
Dieldrin	0.002	0.010
DMDT Methoxychlor	0.005	--
Endosulfan I	0.002	0.010
Endosulfan II	0.004	0.010
Endrin	0.004	0.010
Endosulfan Sulphate	0.004	--
Heptachlor epoxide	0.001	0.010
Heptachlor	0.001	0.002
Mirex	0.005	0.002
Oxychlordane	0.002	--
OP-DDT	0.002	0.010
PCB	0.020	0.040
PP DDD	0.005	0.002
PP DDE	0.001	0.002
PP DDT	0.005	0.010
Hexachlorobenzene	0.001	0.002

-- No Analysis Done

NOTE: In some tables the detection limits appear higher than are listed in this table. This is due to a small sample size.